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EDITED BY

CHAPIN A. HARRIS, M. D., D. D. S.

AND

A. SNOWDEN PIGGOT, M. D.

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ORIGINAL COMMUNICATIONS.

ARTICLE I.

Diseases of the Dental Pulp and their Treatment. By CHAPIN A. HARRIS, M. D., D. D. S.

[Continued from page 531, of Vol. 4, New Series.]

AT the request of the Associated Alumni of American Dental Colleges, the writer prepared and read, at their second annual meeting, a paper on the diseases of the dental pulp. This paper was published in the April and July Nos. vol. 4, New Series, of the Journal, but as only two of the pathological conditions of the organ, *irritation* and *inflammation*, were noticed, he intended to resume, at some future period, the consideration of the subject, but arduous professional and other duties have hitherto prevented him from doing so. At the conclusion of the paper, a few remarks were offered on chronic inflammation, and a brief notice of the method of procedure pursued by Drs. W. W. Codman, of Boston, and W. H. Dwinelle, of Cazenovia, N. Y., in the treatment of exposed dental pulp. A few additional remarks upon this part of the subject will now first claim the consideration of the writer.

When the pulp of a tooth becomes exposed, it is very liable, as stated in a preceding part of this paper, to become the seat of chronic inflammation, and when this happens, the exposed diseased surface pours out serous fluid, rendering the operation of filling, during the continuance of the morbid action, impracticable, as the accumulation of fluid between the filling and the pulp would become an additional source of irritation and soon give rise to a more active form of inflammation. If, therefore, we would preserve the vitality of the tooth, our attention must first be directed to the restoration of the pulp to a healthy condition. This accomplished, the cavity may be filled with a fair prospect of success, but in doing this, care must be taken not to wound the exposed delicate, and, under all circumstances, highly sensitive organ.

Creosote and the essential oils of cloves, cinnamon and cajuput, from their pungent and stimulating properties, have long been held in high repute as odontalgic remedies, but the writer has seldom derived much benefit from them in the treatment of chronic inflammation of the pulp. The application of them, it is true, is often followed by an immediate and complete subsidence of the pain occasioned as a consequence of it, but the diseased action is seldom removed by their use. Dr. Dwinelle recommends, in cases of this kind, the direct application of tannate of lead, and, in two or three cases, the writer has used it with complete success. Still, he has not employed it in a sufficient number of cases, to enable him to speak very decidedly with regard to its merits, having failed oftener than he has succeeded, in attaining the object proposed by its use. A saturated solution of tannic acid in spirits of wine with a sufficient quantity of gum benzoin dissolved in it, to make it of the consistence of thick mucilage, applied on a little raw cotton, has been attended with more satisfactory results in the practice of the writer than tannate of lead.* A two-fold benefit is often obtained by the use of this preparation; for, while the stimulating properties of the

* The use of this preparation of tannic acid was recommended to the writer a few years since by Dr. F. H. Badger, of Nashville, Tenn., but not as a remedy for chronic inflammation of the pulp of a tooth.

alcohol have a tendency to allay pain, the astringent effect exerted by the tannin promotes resolution of the exposed inflamed surface of the pulp. Of the several cases successfully treated with it, it may not be amiss to give a brief history of one or two.

Mr. E., a young gentleman about twenty-one years of age, of a sanguino-nervous temperament, applied to the writer in the early part of the summer of 1854, for professional advice in relation to his left second upper bicuspis. It was decayed in its posterior approximal surface, and some eight or ten months before, the decomposed portion had been removed with a view to having it filled, but as the pulp was found to be considerably exposed, the operation was deemed impracticable. The first molar being in a carious condition and the anterior half broken off, the cavity in the bicuspid was completely exposed to view. As the young gentleman refused to submit to the loss of the tooth, it had been permitted to remain in this condition, though it had subsequently, several times ached, and occasioned considerable annoyance. The pain, however, was usually readily allayed by the application of stimulants, and hence the organ had been permitted to remain in his mouth.

After removing some foreign matter which had accumulated in the cavity of the tooth, the exposed part of the pulp could be readily seen. It protruded slightly into the external cavity, presenting a thickened and inflamed appearance. Regarding the constitutional temperament of the patient as unfavorable for the retention of a tooth after the destruction of its vitality, the writer determined to attempt to subdue the inflammation, and fill the tooth over the exposed pulp. With a view to which, he filled the cavity with raw cotton, saturated with the solution of tannin and benzoin, renewing the application every eight or ten days. At the expiration of four or five weeks, the exposed portion of the pulp assumed a healthy appearance, and had receded back into the central cavity. The tooth was now filled with Hill's stopping, leaving a small vacant space between the pulp and bottom of the filling, intending ultimately to replace it with gold. In three or four days Mr. E. returned, complaining of

pain in the tooth. Supposing it to be occasioned by pressure of accumulated fluid at the bottom of the cavity, the Hill's stopping was removed and the solution applied as before. This treatment was continued several weeks longer, when the tooth was again filled with the preparation used in the first instance, and the patient requested to return immediately, if pain should a second time be experienced, and if it gave him no inconvenience, at the expiration of five or six months. As nearly as the writer can recollect, about nine months elapsed before he again saw him, and as the tooth had given no further trouble, and the filling still remained perfect, he was directed to leave it six or eight months longer, when the writer proposed to remove it and fill the tooth properly with gold. His object in delaying the operation so long, was to give ample time for the formation of a solid protective covering over the exposed part of the pulp. The patient not having yet returned for the replacement of the temporary with a permanent filling, the treatment may be regarded as successful.

Miss W., a young lady about twenty years of age, of a sanguino-bilious temperament and good constitutional health, applied to the writer in the winter of 1854, for his professional services. Several of her teeth were slightly affected with caries, and in one, the first right inferior molar, the disease had penetrated from the anterior approximal surface to the pulp-cavity. This tooth had ached several times, and though the exposed part of the pulp had become the seat of chronic inflammation and was aching at the time, as she was unwilling to lose the tooth, he applied to it, after having first removed all the decomposed dentine, the solution of tannin and benzoin, in the manner as described in the foregoing case, but as the pain was increased by the application, it was removed, and creosote substituted, closing the orifice of the cavity with yellow wax. The pain now subsided almost immediately, and there was no return of it the following day, the cotton on which the creosote was applied was removed, and the cavity filled with another piece saturated with the solution of tannin. This application was renewed every few days for three weeks. The exposed pulp having by this time

assumed a healthy appearance, a gold filling was at once introduced. The tooth, when the writer last saw the young lady, more than twelve months after the operation had been performed, had given her no trouble and was as useful as any of her other teeth.

In the use of tannin in the form here described, there is no necessity for closing the orifice of the cavity with wax to exclude the secretions of the mouth, as the fibres of the cotton, as the alcohol evaporates or is diluted with the saliva, become agglutinated to each other by the benzoin. It answers the same purpose as gutta percha in chloroform.

In describing the successful results which have attended the use of the preparation last noticed in the treatment of chronic inflammation of the dental pulp, it is proper to state, that it has not proved thus efficacious in all the cases in which it has been employed by the writer. It has failed to accomplish the object proposed in a majority of the cases in which he has used it. Still, the beneficial effects which have resulted from its employment, entitle it to a place among the remedial agents resorted to in the treatment of the affection under consideration.

But the first step to be taken in the treatment of chronic inflammation of the pulp, as intimated in a preceding part of this paper, is to free the cavity in the tooth of all accumulations of extraneous matter and decomposed portions which can act as irritants, or aggravate the already existing disease. This done, it may be carefully washed out with tepid water and the remedial agent applied as previously directed. The success of the treatment too, will depend greatly upon the state of the general constitutional health of the patient at the time. An irritable condition of the system or derangement of the digestive organs will, in the majority of cases, render unavailing the most judicious and skillful treatment that can be adopted.

Dr. Koecker regards the preservation of a tooth as practicable, so long as the pulp is not actually in a state of suppuration or deprived of vitality, and he expresses the belief that as many as five out of every six cases, in which caries has penetrated to the lining membrane, may be preserved alive, and it is evident

from the description which he gives of some of the cases he treated, that the pulp was in a state of chronic inflammation at the time. The method of procedure which he recommends consists in first cauterizing the exposed surface with a red hot wire, using the precaution not to touch any part of the surrounding dentinal walls or to wound the lining membrane; the exposed pulp is then covered with a plate of thin leaf lead, with the edges resting upon the surrounding solid parts, and the cavity filled with gold in the usual manner. In the commencement of his practice, Dr. K. states that he was in the habit of using tin foil, but as he was seldom successful, he was induced to substitute lead, believing that the last named metal exerted a "cooling and anti-inflammatory effect upon the irritated nerve of the tooth." Having never adopted this treatment in chronic inflammation of the pulp, the writer is unable to speak from experience, of its relative success as compared with the method of procedure which he has pursued in similar cases.

A solution of sulphate of zinc in rose water, in the proportion of from six to eight grains of the former to an ounce of the latter with thirty-five or forty drops of laudanum, may sometimes be employed with advantage when the tooth is free from pain. It acts as a cooling astringent, producing a very pleasant effect. The cavity in the tooth, however, should be first properly prepared. It is applied like most other remedial agents on a little raw cotton, sealing up the orifice with wax or mastic to exclude the secretions of the mouth. It causes for a few minutes, when first applied, a slight burning sensation, but this very soon subsides, leaving the tooth entirely free from pain. It should be applied once a day until the desired effect is produced, and in closing the orifice of the cavity care must be taken not to press upon the exposed pulp, as the irritation which would be thus produced would counteract the beneficial effects of the preparation. This may always be prevented by placing a cap of tin foil over the dossil of cotton before the orifice is closed.

Ulceration.—It is seldom that the pulp of a tooth can be restored to health after it has become the seat of ulceration.

The difficulty of applying to it suitable remedial agents and protecting it from the action of irritants, such as particles of foreign matter and the secretions of the mouth, increases the difficulty with which the practitioner has to contend, and very often renders unsuccessful, remedies, which, under other circumstances, might produce the desired effect. Still, ulceration, even of this most exquisitely sensitive tissue, is sometimes cured, and when the preservation of the tooth is called for by some peculiar or urgent necessity, every resource of the dentist should be called into requisition for the accomplishment of the object.

The treatment usually adopted in cases of this kind consists in the application of escharotics to the ulcerated surface of the pulp. Nitrate of silver has sometimes been successfully employed. It is used in a diluted state, in the proportion of from six to ten grains to an ounce of distilled water. It should be applied every day until the ulcer is healed, and the cavity in the tooth, after each application carefully closed to exclude all extraneous matter. The tooth, too, previously to commencing the use of it should be freed from all decomposed portions of dentine. Chloride of zinc, has also been used with advantage, but it is less efficient than nitrate of silver.

The application of the actual cautery, as recommended by Dr. Koecker, may, perhaps, after all, be better calculated to bring about a favorable result than any other remedial agent, but it must be very carefully and skillfully applied, to prevent wounding the pulp or touching any other part than the ulcer itself. The dentist having determined to apply it, should first prepare the cavity in the tooth by the removal of all decomposed portions of dentine, and being now provided with a lighted tallow candle, he holds in the flame of it the point of an iron wire until it attains a red heat, then applies it, for an instant only, directly to the ulcer. If this is followed by any bleeding, it is touched a second, and if necessary a third time, in quick succession. This done, the cavity in the tooth is made perfectly dry, a small piece of leaf lead placed over the bottom and the filling immediately introduced. This method

of treatment, according to Dr. Koecker, proved eminently successful in his hands. The writer, however, has never tried it. Indeed, until within the last three or four years, he doubted the practicability of preserving the vitality of a tooth after ulceration of the pulp had taken place, but having been convinced that it can sometimes be done, he no longer doubts the truth of Dr. Koecker's statement. But the use of the actual cautery can only be resorted to in those cases where the diseased surface of the pulp is easy of access.

Should the foregoing methods of treatment fail to restore the pulp to a healthy condition, the vitality of it may be destroyed, either by the application of arsenious acid, or direct extirpation, if the preservation of the tooth be deemed a matter of sufficient importance, and as this often becomes necessary, a brief description of the manner of doing it, and the subsequent treatment may now very properly be given.

Destroying and Extirpating the Pulp, and Filling the Root. Immediate extirpation of the pulp is attended with more pain than the destruction of its vitality with arsenic, and is seldom resorted to in a tooth having more than one root. It is effected by thrusting a very delicate untempered spear pointed steel instrument directly into the nerve cavity to the extremity of the root, then it is severed by a few rotary motions, and if not brought away in the withdrawal of the instrument, may be removed with another having several sharp barbs cut upon it near the point. Some dentists think this method preferable to the other, and better calculated to secure the subsequent preservation of the tooth, but others who have practiced both, deny that the former possesses any advantages whatever over the latter. It is supposed by some that the effects of the arsenious acid extend to the peridental membrane, impairing, if not destroying, its vitality and rendering the tooth obnoxious to the parts within which it is implanted. But this effect can only be produced by a larger quantity, and permitting it to remain longer in the tooth than is necessary to accomplish the object proposed by its employment.

When the pulp is destroyed by direct extirpation, the tooth

may be filled immediately or as soon as the oozing of blood from the mouths of the wounded vessels at the extremity of the root ceases; the effusion of lymph which takes place during the curative process is seldom sufficient to cause irritation.

In destroying the pulp with arsenious acid it is not necessary to use a very large quantity; the thirtieth part of a grain is amply sufficient, combined with an equal quantity of sulphate of morphia. For convenience, have a grain of each thoroughly incorporated, by grinding in a small mortar, then divided into thirty equal parts and each put up in a small piece of paper and kept ready for use. One of these is applied on a dossil of raw cotton, moistened with creosote, or oil of cloves or cajuput and applied directly to the exposed part of the pulp. Over this, a small cap of lead or tin is placed and the cavity in the tooth filled with wax or Hill's stopping, to exclude the buccal secretions and prevent the arsenic from escaping into the mouth. The advantage derived from placing a cap of lead or tin over the arsenic is the prevention of pressure on the pulp in filling the cavity with wax, and the consequent freedom from pain during the destruction of its vitality. When this is done, the tooth rarely aches during the action of the arsenic. With proper care the cavity may, in nineteen cases out of every twenty, be filled with wax or any other plastic substance, when the application of a protective covering to the pulp is omitted, but by using such precaution the liability of it is prevented, and the trouble of applying it is so trifling that it should always be done, at least, by the inexperienced practitioner.

At the expiration of from six to ten hours, the arsenic may be removed and the cavity washed with tepid water. This done, the opening into the central chamber of the tooth is enlarged by cutting away the solid dentine, with instruments properly adapted to the purpose, and when practicable, without wounding the dead pulp, which may, afterwards, in many cases, be brought away almost entire. Every particle of it, however, should be removed to the very extremity of the root or roots, if the tooth have more than one. With a view to which, untempered steel instruments with barbed points, and sufficiently small

to traverse the canal in the root, is introduced and withdrawn several times or until the operator is absolutely certain that no portion of the disorganized pulp remains. This part of the operation is sometimes exceedingly difficult, requiring the patient exercise of no little ingenuity and skill, especially when the tooth is a bicuspid or molar, having two or more roots, and the opening through the crown in the posterior approximal surface. Indeed, it cannot always be done without first filing away one-fourth or one-third of the crown, and increasing the size of the external opening.

In a lower molar the anterior and posterior walls of the canal in the roots, almost meet in the centre, leaving a very delicate opening or canal on each side, from both of which, the elongated pulp is to be carefully removed. This, also, is sometimes the case in a bicuspid, so that instruments not larger than a small bristle are often required. When the root is bent or curved, the difficulty of traversing it to its extremity, is, of course, very greatly increased. The canal in the buccal root of an upper molar is not unfrequently so small that it cannot be penetrated through its entire length, even by the most delicate instrument that can be made. In this case the dentist must be content with the removal of as much of the hair-like elongation of the pulp passing through it as he can bring away, and, fortunately, any portion which may afterwards remain is too small to be productive of serious injury.

The arsenic should never be permitted to remain in the tooth longer than from ten to sixteen hours, and in most cases from six to seven will suffice for the complete destruction of the vitality of the pulp, and when placed directly upon it, a second application rarely if ever becomes necessary.

There is almost always, after the removal of the pulp, a slight oozing of blood from the mouths of the severed vessels at the extremity of the root. This sometimes continues for two or three days. It is, therefore, necessary to delay the subsequent operation of filling, as has been already intimated, until it ceases. The blood which at first escapes does not coagulate, but as the vessels at the apex of the root recover from the effects of the

arsenic and acquire a healthy tone, their extremities soon cicatrize.

The oozing of blood having ceased, the pulp cavity may be syringed out with water and then dried with prepared raw cotton, but the most convenient way of introducing this into the root,* is to wind a small quantity on a probe small enough to penetrate readily to its apex, and made rough to prevent the cotton slipping off when the instrument is withdrawn. This done, the operation of filling may be commenced, but in introducing the gold, different practitioners have adopted different methods of procedure. Some adopt the method proposed by Dr. Maynard, of introducing very thick foil, say No. 15, 20 or 30, cut in strips not wider than the diameter of the smallest part of the canal in the root; others use it rolled into small cylinders as recommended by Dr. F. H. Badger, and others again prefer to introduce it in the form of small pellets. But whatever be the form in which it is used, it is necessary to consolidate it sufficiently to render it impermeable to fluids. When narrow strips are used, the end of one is placed upon the point of an untempered steel filling instrument, of the proper size, and carefully carried to the apex of the root. The instrument is now withdrawn a short distance and again returned, carrying with it another fold, and this is repeated until the entire strip has been introduced, compacting each successive fold as firmly as the instrument will permit. Thus, strip after strip is introduced until the canal is filled. If the tooth has more than one root, the filling of the others may be deferred until a future sitting of the patient. A sitting may be alloted to the filling of each root, or all may be filled at one time. But in filling the roots and pulp cavity of a molar, two or three sittings are sometimes necessary, and having completed these several parts of the operation, the cavity in the crown is filled in the usual manner. The most skillful manipulation is required in every part of the operation, especially when the tooth has more than one root.

* Cotton used for drying cavities in teeth preparatory to filling, should have the oil removed from it by boiling a few minutes in a tolerably strong solution of carbonate of soda, or some other alkali, to make it absorb moisture freely.

When the gold is used in the form of a cylindrical cone, a piece is cut from the leaf, of a triangular shape, and rolled as compactly as possible, using the precaution not to make it too large to prevent it from being easily introduced to the extremity of the root, nor the point so sharp and small as to admit of its being carried above the apex of the fang, as in that case, it will act as an irritant to the periosteal tissues of the alveolus. When there is danger of this, the point should be clipt off with a pair of scissors before it is introduced into the root. The gold being thus prepared, an untempered stilet is introduced to the point intended to be reached by the filling, and the length of the canal indicated by bending the instrument at the commencement or mouth of the canal. The length is then marked on the cylinder of gold. This done, it is carried up to the designated point, then an untempered steel instrument, having a point shaped like the cylinder of gold, but a little smaller, is forced up between it and the root, compressing the former as much as the strength of the instrument will permit. Having proceeded thus far, another cylinder of gold is introduced, and this process is repeated until the cavity is compactly filled. The root or roots, if the tooth has more than one, being filled, the operation is completed by filling the pulp and crown cavities in the usual manner.

The third and last method to be noticed, consists in cutting the gold into small square pieces varying in size from a twelfth to a sixth or fourth part of an inch, depending on the thickness of the leaf and the size of the canal to be filled. These are carried up to their place in the root, one at a time, beginning with the smallest, on the point of a suitable instrument. Each one is compressed as much as the strength of the instrument will permit, as it is introduced.

The relative merits of these several methods of procedure depend very greatly upon the perfection in which each is practiced. The root of a tooth may be very compactly filled by either, but to do it, requires, as already intimated, much time, and the nicest skill in the management and working of the gold, especially when the canal is very small and difficult of access.

The operation is less likely to be successful when performed on the tooth of a person previously to the sixteenth or eighteenth year of age than at a later period, and for the reason that the canal in the root is, up to this time of life, much larger than after eighteenth or twentieth year of age, especially the opening at the extremity of the root. Hence, the root itself, after the destruction of the pulp, is more liable to act as an irritant, and there is greater danger of forcing the gold through it into the socket at its apex, no matter what may be the method in which it is used. An accident of this kind will defeat the success of the operation and render the extraction of the tooth necessary. To prevent which, when the canal is large, the length of it should always be ascertained in the manner as before directed, previously to introducing the gold; by using this precaution, it may be prevented.

In filling the root of a lower molar, when it becomes necessary to introduce two fillings in consequence of the approximation of the walls of the central part of the opening throughout its whole length, leaving only a very small canal on each side, the operation, very often, may be facilitated and rendered more perfect, by enlarging them with a watch-maker's broach. The same may also be done with the bicuspids under similar circumstances, and sometimes with the buccal roots of the upper molars. Indeed, the canal of the root of any tooth, may be enlarged in this way when necessary and easy of access.

The foregoing brief directions, intended only for the inexperienced practitioner, will, the writer trusts, be found sufficient to guide him in the performance of the operation, but cases will occasionally come up in practice where the ingenuity of the operator alone will have to determine the method of procedure most proper to be pursued.

Fungous Growth.—There is sometimes developed from the pulp of a tooth, after it has become exposed, and been in a state of chronic inflammation or ulceration for a greater or less length of time, a morbid growth, which assumes the form of a small vascular tumor of about the size of a duck shot or elderberry, and as sensitive to the touch as the pulp when in a heal-

thy state. It rarely grows very rapidly, and never attains a very large size. It always proceeds from the exposed parts of the pulp and is preceded, usually, for several weeks by chronic inflammation or ulceration. The proper remedial indication consists, in the majority of cases, in the extraction of the tooth, though the fungous growth, it is probable, when wholly confined to the pulp, may sometimes be repressed by the application of escharotics or the actual cautery. The disease, however, is usually regarded as incurable.

It often happens that the central cavity of a tooth, after it has become exposed by the decay of the crown, is occupied by a morbid growth, which has originated from the periosteum of the root or gum, the caries having extended through the neck of the organ. Through this opening the fungous growth finds its way into the tooth, filling in a short time both the central and crown cavities. Tumors of this kind are frequently mistaken for a morbid growth of the pulp. They usually grow very rapidly, and sometimes attain a very large size. They are also very vascular and bleed freely when wounded. The writer has frequently met with tumors of this sort which had their origin in the alveolo-dental periosteum at the extremity of the root, the morbid growth having made its way through the enlarged canal into the crown. It is scarcely necessary to say, that fungous productions of this character can only be cured by the extraction of the tooth, inasmuch as they are always soon reproduced after removal. The teeth, too, in which they are met with are usually so much decayed as to preclude the possibility of their preservation.

Spontaneous Disorganization.—This affection, as the writer has stated in another place, seems to have been entirely overlooked by writers on dental pathology, and although it is one which rarely occurs, examples of it are met with sufficiently often to entitle it to a place among the diseases of the teeth. The first case to which his attention was particularly directed, occurred in 1836. Since which time, eight or ten other cases have fallen under his observation. In each, the disorganizing process was carried on so insidiously that neither structural

alteration or the existence of diseased action of any kind was suspected, until the teeth assumed a dull bluish brown appearance. In neither case, so far as could be ascertained, was there the slightest indication of inflammatory action. The death was seemingly the result of the suspension of the nutritive function occasioned by the want of sufficient vital energy to carry it on.

In all the cases which the writer has seen, the sockets of the teeth were, apparently, in a healthy condition, the margins of the gums thin and regularly scolloped, without any indications of structural alteration, except that they had a dingy grayish-purple appearance, instead of a pale rose color, the aspect they exhibit around living teeth in good constitutions. The disorganized pulp does not, as in those cases where it has perished from inflammation or from the application of escharotics, seem to exert any morbid effect upon the parts at the extremity of the root. This, as he has elsewhere stated may be owing, in part, to diminished excitability in the alveolo-dental periosteum, and to the inoxious character of the disorganized matter. The death of the pulp in all the cases which have fallen under his observation occurred before the twentieth year of age. It rarely takes place in a single tooth, though examples are occasionally met with, but in the majority of cases it occurs simultaneously in corresponding teeth, the pulps of two or four usually perish at about the same time. In the first case which came under his observation, six had perished. The incisors, however, appear to be more particularly subject to it than the molars and bicuspids, and it occurs as frequently in sound as in decayed teeth.

The death of the pulp not being the result of inflammation, must be dependent upon constitutional rather than local causes, upon some impairment of the function of sanguinification or an exceedingly serous condition of the blood.

The subject of the first case seen by the writer was a young lady about eighteen or twenty years of age, of a chlorotic habit and having a slightly bloated aspect of countenance. The discoloration of the teeth had existed several years and was confined to the four upper and two central lower incisors. The

parents of the young lady supposed it was occasioned by caries in the approximal surfaces, and it was for the removal of this that he was consulted, but the teeth, upon examination were, to their astonishment, found to be perfectly sound. Not the slightest indication of structural alteration in either the enamel or dentine could be detected. The cause of the discoloration was now ascertained to be the result of the disorganization of the pulps, and the removal of these seemed to constitute the only and proper remedial indication. With a view to which, a perforation was made in each of the upper incisors, from the palatine side to the central chamber, large enough to permit the complete removal of every thing contained in them. A drop or two of dark brown matter of about the consistence of thick cream, and almost wholly without odor, immediately escaped. The walls of these cavities were slightly discolored, but on being scraped they became as white, though not as translucent as healthy dentine. The natural color of the teeth having been very nearly restored, the pulp-cavities and roots were filled in the manner as already described. The two lower incisors not being so conspicuous were permitted to remain as they were.

It rarely happens that a tooth which has lost its vitality by the spontaneous destruction of the pulp, gives rise to the formation of alveolar abscess. The writer does not recollect of having met with a single case in which this has happened.

Ossification.—With regard to this affection the writer can only repeat what he has elsewhere stated upon the subject.* Ossification of the pulp of a tooth is a means employed by nature to prevent the exposure of this most exquisitely sensitive tissue. It is true, examples of it are occasionally met with in teeth which have not suffered any loss of substance, either from mechanical or spontaneous abrasion or from structural alteration of either the enamel or dentine. The occurrence, whatever may be the circumstances under which it takes place, is unquestionably the result of an established law of the economy, dependent, no doubt, upon moderate irritation and increase

* See Principles and Practice of Dental Surgery.

of vascular action. The deposition of earthy salts having commenced, it usually goes on until every part of the pulp is converted into a substance analogous to, if not identical with, cementum. Thus, it would seem, that when the pulp of a tooth becomes the seat of a sufficient amount of irritation, ossification follows as a necessary consequence, but if the irritation be succeeded by active inflammation, a different result takes place, namely, suppuration.

The irritation necessary to the ossification of the pulp of a tooth sometimes arises from constitutional causes, but in the majority of cases, it results from the action of local irritants, and most frequently, from impressions of heat and cold, communicated through the conducting medium of a metallic filling or a thin layer of dentine.

During the ossification, a sensation is occasionally experienced in the tooth somewhat similar, though altogether less in degree, to that which attends the knitting of the fractured extremities of a broken bone. A numb, slightly twinging pain, barely perceptible, is felt passing through the tooth several times a day, but lasting only a second or two at a time. It is scarcely sufficient to occasion annoyance, or to attract any thing more than momentary attention.

With the ossification of the pulp, the crown and inner walls of the root lose their vitality, but the appearance of the tooth is not, as in the case of necrosis arising from disorganization of the pulp, materially effected. The central cavity being filled with semi-translucent bone, or osteo-dentine, the crown retains its natural color. The discoloration and opacity attending necrosis, arising from other causes, results, partly from the presence of putrid matter in the pulp-cavity, and partly from its absorption by the surrounding dentinal walls.

There are several beautiful examples of ossification of the pulps of teeth in the Museum of the Baltimore College of Dental Surgery, and the writer has some eight or ten in his own private cabinet.

ARTICLE II.

Filling Teeth. By F. H. BADGER, D. D. S.

IN attempting to comply with your request, that I should write out a description of the manner in which I accomplish the filling of cavities in the posterior sides of the second, or third molar teeth, as there is no one better acquainted than yourself, with the necessity of changing the mode to suit the various cases, or the fact, that to write out a description of each, would require a considerable treatise. I have acted upon the supposition that you only wished a description of a single case, that should be one of the most difficult; and, therefore, offer the following, which occurred in my practice in New Orleans. It is also illustrative of other troubles! the hindrances opposed to a satisfactory examination of the teeth, and the consequent liability of decay, in some situations, to escape detection, &c.

On the 4th of March, 1851, Miss H——, of that city, called on me for my attentions to her teeth, which, on several accounts, she was most anxious should embrace every thing I might think it necessary to do to them. Accordingly, in the course of treatment, which required some six weeks, unusual care was taken to discover every defect. Notwithstanding my closest scrutiny, however, the safety of two important teeth would at least have been endangered, but for a disclosure which happened in consequence of extracting the two superior wisdom teeth, which were ruinously decayed in their grinding, and buccal sides.

These two operations it had been supposed would complete the entire series. But upon examining their anterior approximal surfaces after removal, a whitish clouded appearance was observed—in other words, incipient decay was present, at a point where they were previously supposed to be sound. This of course led to a further examination of the posterior sides of their anterior neighbors; or rather a feeling, or probing with an instrument; for nothing more at the time could be done on ac-

count of the flow of blood—no cavity was found in either tooth; and I fear that at this time, it would have been something too easy for my patient to have persuaded me that nothing more was necessary, had she been so disposed—not so however, far from it—she was resolutely bent on having me pronounce the teeth certainly *sound*, or to make them so by operation.

The corners of the mouth were alternately stretched back to their utmost capacity, and it was found that it would be impossible to obtain room in this way, even for the eye to rest satisfactorily upon either of the defects, should they really exist.

It was in vain I commented on, enlarged, and as the sequel will prove, exaggerated the difficulties to be encountered in filling, should that operation become necessary, the probable necessity for mutilating the teeth with the file, in order to get at the parts, the extraordinary stretching of the mouth, the suffocating effects of napkins, or other salivary absorbers, her oft-repeated, though unavailing attempts to appease a rebellious disposition to swallow during the operation, &c. All would not do. When I had gotten through with what I intended should be a most terrific expose; the lady smilingly requested to know "when she should call again?" What could I do?

Three weeks afterwards she called, and on passing the mirror behind the teeth, the only available means I had of obtaining a view of the parts, a chalky spot was discovered on each; wonderfully alike in size, shape and position, and both yielding readily to a small cutting instrument.

Now, be it known, these spots, were but slightly removed from the gum, and decidedly nearer the palatine than the buccal surfaces of the teeth. (Dentists will understand this.) They were about the size of a No. 5 shot. The teeth appeared broader on the grinding surface, and narrower at the neck than usual, thus giving their posterior sides an inclination backward, the mouth was small, the saliva abundant.—What was to be done?

I had once in my early practice, Hunter's ideas on the subject being fresh in my memory, extracted a tooth similarly situated, plugged, and returned it to its socket; and although it proved an utter failure, I thought of the plan in the present

case; I will not say seriously, but I thought of it, for really I did not know what to do. But being enlisted, there was one thing I was resolved upon, and that was to *do my best.*

In the first place, it was necessary to ascertain whether the decay could with propriety be eradicated with the file. This was "a consummation devoutly to be wished," but one which from appearances there was little room to hope for.

Placing myself nearly in front of my patient, with the mirror in my left hand, and a bent excavator in my right, I went to work on one of the teeth. The spoiled part being comparatively soft, it was not long before sound dentine was reached below; at such a depth, however, as to forbid an operation with the file.

My worst fears were realized—the tooth had to be filled, or lost, perhaps both! I thought of the "fusible metal," and of "metallic paste," and then of "Hill's stopping," as perhaps better than either. But never at that time, having used either of those materials, except the first, by way of experiment, many years since, and then at the instance of an older practitioner, I felt loth to adopt them now, particularly if any thing better could be done.

In the mean time the decay was removed, leaving the cavity a little too much excavated, and ragged at its entrance. To remedy this, a burr-drill was selected, rather larger than the orifice; placed in its handle, and passed through a gold tube, used to cover the shaft of the drill, to prevent friction on the lip, the burr projecting some half an inch beyond its end. Thus prepared, the tube containing the drill, was placed in the corner of the mouth, and forced back until the burr rested on the mouth of the cavity in the tooth; the shaft, forming a little more than a right angle with the row of teeth. The burr was then rotated until about two-thirds imbedded, then removed and the cavity washed out with a syringe, when its entrance was found to be round, smooth, and solid; and a few more touches with an excavator, fitted it for the reception of a plug. By this time I had fixed upon a plan which I intended at least, to *try.*

Abbey's No. 4 gold-foil was folded into a strip, one-third

wider than the cavity was deep. The strip was then folded end-wise upon itself until it could be folded no longer, then rolled in the hand with the finger, the proper amount of foil having been used, a pellet was formed the thickness of the burr drill which had been used, its length being the same as the width of the strip out of which it had been formed. It was then forced through a smooth hole in a steel plate, a little too small to allow the burr to pass through, in order to insure its ready entrance into the cavity it was intended to fill, then annealed, and placed conveniently for use.

The necessary preparations having been made to begin, part of a bottle cork was placed between the opposite jaws to prevent the mouth from closing. A pledget of blotting paper was then placed over the mouth of the duct of steno, to prevent, or imbibe the flow of saliva in that quarter, and a small linen napkin also intended to absorb moisture, placed between the lip and gum in front, and carried back between the cheek and jaw, around the tooth to be filled, thence forward over the tongue to the front of the mouth.

With cotton on the end of a carrier for the purpose, and small rolls of tissue paper, carried to the place with a curved tweezers, the cavity was well dried. Having the mirror in the proper place, the pellet was caught with the tweezers, carried back and introduced into the cavity, then pressed home with a flat-ended instrument. A curved instrument was then selected with a tolerably sharp point, with which the pellet was pierced through its centre, to the bottom; other instruments possessing a like curve, but with successively larger points, was forced into the same opening until the gold was brought in close contact with every part of the cavity, and rendered exceedingly dense. The opening in the gold was then filled with a suitable pellet, prepared similar to the first, but rather shorter. This was forced in, a little below the surface of the first pellet which still projected above the mouth of the cavity. The gold overlapping the edges of the orifice, was now gathered up towards the centre, over the outer end of the second pellet and pressed down with a crank shaped instrument with great force.

The napkin, &c., was now removed, and the patient allowed to rest. The gold was then alternately pressed, filed, and burnished, until brought down to a level with the surface of the tooth, and finished.

No moisture was allowed to enter the cavity during the operation.

The plug was hard, and presented as perfect an appearance as any I had ever before inserted. The time occupied in the operation was much less than in some others which had preceded it, where the cavities were much easier of access.

I was delighted, of course, with my success. So was my patient. And two days after the opposite tooth was treated in the same manner.

NASHVILLE, TENN., *Nov. 4th,* 1855.

ARTICLE III.

Pivoting Teeth. By JOHN COGHLAN, M. D., M. R. C. S. Eng. &c.

"PIVOTING, though the neatest, is more frequently followed by mischievous results than any other operation performed by the dentist; and so common are these, that many surgeons consider the operation unjustifiable."—*Tomes' Den. Sur., p.* 320.

In the course of my practice as a dentist, I have had, in common with other members of the profession, frequently to regret the occurrence of inflammation, abscess and other disagreeable results of the operation of pivoting teeth. No doubt, the number of such cases may be greatly diminished, by skill and care in performing the operation; but, still, a sufficient number has hitherto remained, to have formed a standing objection to that beautiful mode of fixing artificial teeth.

The wooden pivot, so extensively and successfully used in America, is, I have reason to think, not so likely to produce

alveolar abscess as the metallic one generally used in this kingdom, and throughout Europe. The difference in this respect, appears to me to depend on the wooden pivot being generally shorter, and rather slack, when pressed into the canal of the stump; the operator, depending, in a considerable degree, on the swelling of the wood to give it the necessary security. On the other hand, when a metallic pivot is used, it more nearly fills the canal, and is totally dependent for its stability on the firmness with which it is pressed in at the time. It might then, be asked, why not use the wooden pivot. In reply, I would state, that I have seen teeth pivoted with gold, still firm and perfect after having been in the mouth for 10 or 20 years! and that could not possibly be the case with wood! And again, should the canal of the stump not correspond in duration with that of the teeth to be put on, it complicated the operation considerably, and if, as sometimes occurs, the deviation be very great, it would, in my mind, form an insuperable objection to the wooden pivot.

In treating of pivoting teeth, the stumps operated upon, may most usefully be divided into two classes. In one, we may have the walls of the stump sound, but the nerve and vessels are so far destroyed, that the operation of pivoting, though with a metallic pivot, is got through without giving the slightest pain; the patient goes off much pleased, but unfortunately, his pleasure may be of short duration, as the practical dentist well knows, that those are the cases in which alveolar abscess is most likely to occur. In the other class of cases, we have the stump not only sound, but the nerve and vessels in a perfect state of integrity, so far as they are concerned; and if we except the momentary pain of destroying the nerve by the turn of a broach, we have no pain in pivoting, till we try to push our solid metallic pivot into its place, and in a large number of cases even that is got over pretty well, in consequence of the slackness of the pivot. But if in our anxiety to make a good and permanent operation, and to exclude the fluids of the mouth from the sides of the canal of the stump, we should be tempted to use a tight pivot—wriggle it up carefully as we may, still, when it gets nearly home, the patient screams out with sudden pain; and

though it quickly subsides, yet we have generally, in those cases, inflammation followed by alveolar abscess.

In reasoning on the cause of these results, I came to the conclusion, that in the first case, we plug up an old secreting surface at the top of the stump, at the very time that it is probably excited into greater activity by the disturbance of the parts from the operation. In the other class, we convert the canal of the stump into a small forcing pump, and inject the column of air contained in it, by means of the tight pivot, into the sensitive tissues at the apex of the tooth. The result is inflammation, if slight it may subside and all go well; but if of a more severe character, we have secretion and consequent abscess.

Impressed as I have been for some years past with the correctness of these views, I have cut grooves in the pivot, and in fact tried every device I could think of, or that had been suggested to me, for the purpose of overcoming the difficulty; but I failed in any good *practical* result, till I thought of substituting a capillary tube for the solid pivot. The effect of the tube has been most satisfactory. By using a little care it may be used with all sorts of teeth having a thorough outlet. It may be tapped for screwing through natural teeth, or fastened by the same means as the solid pivot to the different manufactured ones. When using solder, I have sometimes found it of advantage, to suck up a little finely powdered pure plumbago and water through the minute tube of the wire, in order to prevent its being encroached upon; I have thus entirely got over the disadvantages and lost none of the advantages of the solid metallic pivot.

After having thoroughly tested the practical value of this improvement, I took a conditional protection from the patent office for this kingdom, not with the intention of securing to myself the exclusive use of it, but for the purpose of having a public record of my having originated and worked out the idea. Influenced by these feelings I give an unlimitted license to use it, to the profession at large, and the following is a copy of my specification.

"I, John Coghlan, of Wexford, in the county of Wexford, Ireland, M. D., member of the Royal College of Surgeons of Eng-

land, do hereby declare, that my invention of an improved method of pivoting artificial teeth, consists in the use of a capillary tube, in lieu of the solid wire now used for that purpose.

"The advantage gained by my invention is, that the column of air necessarily contained in the canal of the prepared stump of the tooth, has an easy means of escape, and is not injected into the living tissues, as is so often the case, in using the solid pivot.

"With this capillary tube, a tooth may be at once pivoted tightly, without any disturbance of the parts; and consequently, with an enormously diminished risk of alveolar abscess.

"This method applies to the pivoting of all artificial teeth, and is perfectly new; and, in the case of old secreting stumps, it affords a ready mode of giving exit to the secretion.

"The capillary tube may be so small as not appreciably to diminish the strength of the wire, or interfere with binding it, in adopting the tusk to its proper position.

"Signed, JOHN COGHLAN.

"*August* 15*th*, 1855."

In conclusion, I would confidently express my conviction, that the use of the tube, will remove from the operation of pivoting, the odium which has hitherto been attached to it.

WEXFORD, IRELAND, *October* 13*th*, 1855.

ARTICLE IV.

Some Remarks on the Employment of Chloroform by Dentists.

ONE of the most important questions which can be propounded to any practitioner of surgery, whether general or special, is that of the propriety of employing chloroform in any given case. It is a question, too, which cannot be evaded, for even if the operator himself be indisposed to administer it, and refrain entirely from suggesting its employment, yet the patient will

be very likely to propose, and may insist upon, its use. There is an instinctive shrinking from pain in all men, and many are willing to risk much in order to ensure entire immunity from suffering.

It is the purpose of this article to make some calm inquiries into the use of this agent in surgery, and especially that department of the art which is practiced by the majority of the readers of this journal. Originality is not claimed for any of the propositions advanced, the entire design of these remarks being to call attention to the present state of our knowledge in reference to this important question.

It is certainly a very remarkable fact that although this agent has been used for several years, in a very large number of cases of every age, of both sexes, and for almost every variety of disease, and although there have been many deaths occurring under its influence, yet we are still far from a rational and satisfactory account of the method in which it kills. First the brain, then the lungs, and last of all, the heart have been suspected. Ricord recommended insufflation. This was found to be difficult in some cases, and it was believed that the trouble arose from the position of the epiglottis covering the orifice of the trachea. It became fashionable then to thrust the finger into the mouth of the pulseless patient, to lift up the epiglottis and then vigorously to inflate the lungs. All reported cases under this mode of treatment had a favorable termination, but as the journals have gradually become silent upon the subject, it is fair to infer that the theory and practice have been both laid upon the shelf together.

Of late, the favorite theory has been that which attributes the fatality attendant upon the use of this agent to a disease of the heart, in which the muscular fibres of that organ are converted into fat. The only known indications of the existence of this condition of the heart are a weak, intermittent pulse, liability to faint, and *arcus senilis*. This is a disease of the cornea in which the outer margin of that organ is affected with the same fatty degeneration, so that there appears to be a dull yellowish-gray ring surrounding and obscuring the outer edge

of the iris. There are some grave reasons, however, for believing that this theory will share the fate of its predecessors.

In the first place, we have the undeniable fact that many of the so-called victims of chloroform have presented no evidence whatever of the presence of any such disease. The affection alluded to is peculiarly a disease of old age, and though it may come on at any period of life, it is more likely to attack the aged. It is also exceedingly difficult of diagnosis, so that the mere presence of the arcus senilis in one eye is not a certain evidence of the disease of the heart, while, upon the other hand, it may exist without any external indication of its presence. In several recent cases of death during the use of chloroform, this degeneration of the muscular fibres of the heart has been discovered, but by far the greater majority of fatal cases have exhibited no such lesion, even upon careful microscopical examination. It would be exceedingly unphilosophical to assume that the comparatively few cases in which the disease has been recognized, should be suffered to explain the many in which nothing of the kind has been detected.

Dr. Snow, in commenting upon the propriety of using chloroform in surgery, remarks, that "patients with fatty degeneration of the heart are liable to die suddenly in two distinct ways: first, with the cavities of the heart empty; and secondly, with the cavities of the heart full of blood. In the latter case, death is caused by the inability of the weakened heart to propel the blood; but, in the former case, when the patient dies by ordinary syncope, such as that occasioned by loss of blood, and where the cavities of the heart are empty, death must be caused by some undescribed condition which accompanies the disease of the heart, and not by that disease itself; for the most healthy heart would be unable to maintain the circulation when the blood no longer reached its cavities from the veins."

Now it so happens, that, in most of the recorded autopsies of patients dying suddenly under the use of chloroform, the cavities of the heart are stated to be empty. In these, then, we have the unknown element of disease supposed to accompany the cardiac affection. We have no reason, however, for infer-

ring that this unknown quantity always requires cardiac fatty degeneration as a factor. For aught we know it may coëxist with a healthy state of the heart, and it is, in the present state of our knowledge, an unwarrantable assumption to insist upon uniting two morbid conditions between which there has not been demonstrated any necessary connection. Indeed, the chances are that the majority of those who have died under the use of this agent have had healthy hearts. Dr. Snow himself, though a warm advocate of the employment of chloroform, acknowleges this. He says:

"Out of the entire number of deaths from chloroform which are recorded, there are very few in which any considerable disease of the heart was found. In fact, the majority of those who are dead from chloroform were healthy persons in the best period of life—that is, from fifteen to thirty-five or forty, and it is most likely that they had, on an average, a sounder state of the heart than the multitude who have inhaled chloroform with impunity."

This distinguished surgeon goes still farther, and maintains that chloroform is likely to prove beneficial rather than otherwise to patients affected with this disease. He argues, that the pain attendant upon a surgical operation is likely to produce both the fatal conditions of the cavities of the heart, while chloroform, on the contrary, has a tendency to keep the circulation more equable. He says he has given chloroform with a favorable result to a great number of patients having all the symptoms of fatty degeneration of the heart. The only patient he has ever lost, while using chloroform, had this disease, but he doubts that the death was caused by the anæsthetic. He seems rather disposed to attribute it to a straining effort which the patient commenced, as if he began to feel the pain of the operation.

In speculating upon the causes of the sad results we are considering, it should always be born in mind that sudden deaths upon the operating table were not uncommon before the introduction of anæsthetics. Dr. Simpson narrates two cases in which the patients died, after the most trivial incisions. In one

the skin only had been cut, and in the other, an abscess lancet had been introduced. Another case occurred in Edinburgh just before the introduction of chloroform. A patient had just had his groin shaved preparatory to the operation for strangulated hernia, and the surgeon was about to proceed, when the patient fainted and died before any incision had been made. Most of the cases of this kind may be accounted for by the effects of pain or mental emotion upon a highly susceptible nervous system. Other deaths, occurring after operations, may have depended upon syncope resulting from hemorrhage, a condition which chloroform is undoubtedly calculated to promote, as it greatly increases the tendency to bleeding.

From what has been said, it follows, that the true cause of death from chloroform remains as great a mystery as ever. The mode of death varies, the heart appearing in some cases to die first, while in others, a paralysis of respiratory motion is the first effect. Its action upon the blood is not well known. Out of the body it gives a florid, arterial hue to venous blood, and the red corpuscles are found to be dissolved, while the white globules remain unaffected. Upon the color of blood circulating in the vessels, however, it does not exert any such influence. Whether the corpuscles are dissolved or not, when this agent has been administered in the usual way, by inhalation, and whether the anæsthetic passes unchanged into the blood, are questions which do not appear to be satisfactorily answered, although the general disposition is to reply to them in the affirmative.

M. Denonvilliers has recently published, in the *Annuaire de Therapeutique*, a synopsis of the present condition of our knowledge in regard to this subject, in which he takes the same ground already assumed in this article. He says:

"An analysis of the facts shows that these serious consequences which have resulted in death, have followed the administration of chloroform in large doses for a long time, or where the dose was small and taken for a short period, or where the patients were already enfeebled, or had undergone a long or great operation; or lastly, where the subjects were young and vigor-

ous and had borne an operation of only average magnitude and tediousness. Contrary to all expectation, these fatal results have been much more frequently observed in the last condition than in the first, so that it has been supposed that these consequences are to be attributed to some *peculiar susceptibility* of the victims, rather than to the quantity or concentration of the chloroform vapor. This susceptibility is *unknown in its nature*, and would seem to be only *temporary in its influence*, since persons have succumbed to a second chloroformization, after having borne the first operation very well."

The last remark is very important, and ought to be deeply impressed upon the mind of every one who uses this powerful remedy. It should be a sufficient caution to all not to employ so dangerous an agent in slight or unimportant operations. The mere immunity from pain is purchased at too great a risk. Dentists also should remember, that if, as M. Denonvilliers believes, "chloroform acts directly on the heart, whose contractions it can suspend immediately and indefinitely," the position in which they place their patients must necessarily favor an unfortunate result. It is true that Dr. Snow asserts, that there is no objection to a sitting posture, since chloroform usually increases the force of the circulation; and yet he strangely enough contradicts himself by recommending that the patient should be placed horizontally if symptoms of faintness come on.

Setting aside, however, the general objection of this obscure and unknown malignant power, what are the special contra-indications to its employment? Generally, it may be answered, all injuries which, by their great severity, or by the regions they affect, have a tendency to produce syncope; decided disease of the heart, brain or lungs, and all operations in which blood is likely to be poured into the air passages, or in which, either the sensations or voluntary motions of the patient may assist the surgeon.

The use of this agent once determined upon, there are certain precautions to be observed in order to ensure success. Some of these relate to the agent itself, others to the mode of administration. Denonvilliers gives the following signs by which to

recognize the purity of chloroform. 1st. It gives out an agreeable odor, very much like that of the apple. 2d. Rubbed on the palm of the hand it will volatize without leaving the peculiar and nauseous odor of chlorine. 3d. One drop, when it falls in a glass of water, will sink to the bottom of the vessel, and preserve its limpidity. 4th. If it is mixed with a little sulphuric acid, no change of color is produced. All the old cumbrous apparatus having been now generally abandoned, it is only necessary to say that the handkerchief is at once the most convenient and most efficient inhaler that can be employed.

The fears of the patient are to be allayed before any chloroform is administered, or bad results may follow. Independently of this, however, fear perturbs the respiration, and it is essential that the breathing should be calm and regular. Another important point is not to administer chloroform when the stomach is full, as it may cause vomiting. This, being liable to come on at any time after the administration of the anæsthetic, may occur during the operation. It is not attended with any danger, but is a disagreeable accompaniment, and one which sometimes seriously interferes with the success of the operation. Dr. Snow says, that the best time is before breakfast, and if that is impossible, two or three hours after a slender meal.

For the rest, Denonvilliers gives such minute and satisfactory directions, that it is not necessary to do more than quote from him.

"The surgeon ought to preside over the inhalation himself. He should watch the general condition of the patient, and observe at the same time his circulation and respiration. For this purpose he should keep his finger on the radial artery, until he is ready to commence the operation, and then his place should be taken by a careful assistant, who should, from time to time, inform him of the state of the pulse and announce its variations.

"It is during the first moments of the process that chloroformization presents most dangers, and then our precautions should be greatest.

"We should begin with very small doses of chloroform and

gradually increase the quantity, after having ascertained that it will be well supported. The action of chloroform being progressive, we can produce insensibility by merely continuing the inhalatives without being always compelled to repeat the dose.

"If the circulation or respiration become disturbed, we should suspend the process to permit the patient to rally, and then begin again. If the disturbance of these great functions become at all serious, it is prudent to discontinue our efforts for the time, and if possible defer the operation.

"Chloroformization should be pushed more or less far, depending on the operation which has to be performed, or the effect we desire to produce, but in all cases we should cease its administration as soon as insensibility is established.

"If it is necessary to prolong the anæsthetic state, we should return with caution to the chloroform as soon as the patient begins to recover. We can thus without pain or inconvenience to the patient, conduct an operation of an hour's duration. Nevertheless, whilst this large quantity of chloroform vapor is being absorbed, we should be on our guard against the consecutive syncope.

"Although we rarely see bad consequence supervene after the operation is concluded, yet the surgeon should not leave his patient until he has perfectly recovered his consciousness.

"In those cases in which syncope occurs, we should pursue the following course:

"1st. Place the patient on an inclined plane, so that his feet are elevated and his head occupying the lowest point.

"2d. Practice artificial respiration by regular pressure on the thoracic and abdominal walls, forcing open the mouth and drawing out the tongue, whilst we irritate the back of the throat with the finger or a spatula.

"3d. Open the windows so as to introduce a quantity of fresh and pure air.

"These means will often be successful, but only when they are carried into effect with promptness, energy and perseverance. With regard to the frictions, kneading, cold affusion, ammoniacal vapors, these are agents whose action is too uncer-

tain and above all too slow, to be considered in any other light than as adjuvants.

"In some experiments made on animals, M. Giraudet concludes that any cause which prevents the free play of the diaphragm, during the inhalation of chloroform, will cause death promptly.

"The same experiments has found that chloroform would produce fatal consequences wherever the phrenic nerves had been previously tied.

"M. Giraudet declares that, of all the means to which he has resorted in his efforts to restore animals to life, after the inhalation of chloroform, none will compare with the effect produced by the passage of electro-magnetic currents through the diaphragm, or in establishing a current along the course of the phrenic nerves."

ARTICLE V.

Artificial Teeth Mounted in Gutta Percha. By N. B. SLAYTON, Madison, Indiana.

YOU will do me a favor, and I doubt not confer the same on many of the profession, if you can spare room in your Journal to insert a few lines on the proper use of gutta percha as a base for artificial teeth.

Some few weeks since I sent a small circular to as many of the profession as I could learn of their whereabouts, giving the result of a course of experiments that I had made with gutta percha.

I had no idea at that time that it would attract so much attention, or be received so favorably by the profession. I then offered it to the profession for temporary work, and for nothing more, and that is all I now claim for it. I stated at the same

time, that I was satisfied that in many cases it might be used to advantage for permanent work, and from my experience since that time, as I became better acquainted with the properties of gutta percha and the manner of working it, my impression is, that in nearly every case where the teeth are long and gums soft and tender, it will be preferred to any other material for permanent work, both by the patient and dentist.

Gutta percha cannot be used for every thing, neither can it be used to advantage in *every* case for *temporary work.* I wish here to state, when gutta percha *can* and cannot be used to advantage, &c., so far as my own experience goes. *Others* may claim what they choose.

When teeth are extremely short and set close together, you have not room to unite the gutta percha between and around the teeth, so as to make it firm and durable. If short teeth were made with narrow necks, so as to let the gutta percha pass freely through and unite firmly on both sides, it might do well. The teeth that are best adapted to this kind of work are those made for Allen's continuous gum work, they have narrow necks, and will permit the gutta percha to pass freely between them and unite firmly around the teeth, and at the same time adhere firmly to the gutta percha on the opposite side. This is necessary both for strength and neatness, and if properly done, will prevent any food from lodging around the teeth, or even moisture getting between the teeth and gutta percha, thereby preventing any unpleasant smell that would naturally arise from it. Common plate teeth would do well if ground narrow at the base. It is as necessary for a dentist to exercise his judgment in the working of gutta percha as in any other part of his duties. It is impossible to stick gutta percha on plate or on the teeth, and have it remain long, unless a man understands well the manner of working it, and then it requires judgment to know when and where it should be used.

I have spent a good deal of time and money in learning the best way of working gutta percha, and to make it as simple as possible. I dont pretend to have perfected the working of this material, but one thing I do say, that unless a dentist is well

posted up in the manner of working of gutta percha he will find it cheaper for him to pay any reasonable sum for that instruction, than to learn it from his own experience, that is, if he values his time as worth any thing, throwing aside the expense and trouble.

I have within the last six weeks instructed a large number of dentists. Some work it beautifully, while others make a perfect botch of it. It is not only necessary for a man to see it done, but he must take hold and do it himself, and if he should fail the first time, *no matter, try again.* The only way this gutta percha can be brought to that perfection that our profession need, is for every one to try and make some little improvement, and when these are all combined, I doubt not, we shall have just the thing we want. My greatest fears are, that the profession, as a *mass*, are expecting too much of this material, and will use and recommend it when they ought not to, and thereby kill it in the bud. I find dentists are like every body else, too much inclined to make a hobby of a new thing and use it in every case, and recommend it to *all* their patients as being superior to every thing else, and then, if it should not prove what *they themselves* claim for it, will consider it as being a great humbug. Such has been the fate of some of our most valuable improvements, and such *may* be the fate of gutta percha, if not used with more judgment than some are now doing. My intention is to try and bring this improvement within the reach of every dentist, but not to *force* it upon any one. I dont think it possible for me to explain the manner of working gutta percha on paper, so that a dentist can work it successfully without further instructions, unless he is well posted upon its peculiar properties, and has experimented with it before. Such is the opinion of nearly all when they have once seen it worked. I am not selling a patent right; if a dentist wishes to learn my manner of putting up this style of work, I *instruct* him, or cause my agents to do so, and charge him a reasonable price for my services.

On my first bringing this before the profession I made application for a patent for my mode of working gutta percha, but

by the advice of a number of dentists, who thought it might prejudice many against it, I withdrew that application, and secured myself on the gutta percha, that is, my manner of *refining* and *coloring* it. And then sell no man the material unless he has first been instructed how to use it. In this way I secure myself, and give those that received instructions better security than I could by patent. I have several agents in the United States, who are authorized to instruct dentists in the manner of doing this work, and they will try and bring it within the reach of all.

I have made Messrs. Jones, White & McCurdy, of New York and Philadelphia, my only agents for the manufacturing and sale of the colored gutta percha, and from the well known reputation of this house, I think the profession may rest assured that they will receive nothing from their hands but what is pure, and that they will do the best to make every improvement that is possible to make with gutta percha for dental purposes.

The cost of gutta percha for a full upper set of teeth is from seventy-five cents to one dollar and fifty cents, with no waste, and the time usually spent in making them is about four hours, and when properly done, will wear smooth and hard. It can be made as firm as any plate work and look as well as the best gum teeth.

To keep this work clean and sweet, all that is necessary is to give your patient a suitable brush and have him use soap and water freely.

I have deemed it necessary to make this explanation, that every one may see what I *do claim*, and what I *do not*, and how the gutta percha is disposed of, the cost of material and who it can be obtained from.

Any one wishing further information on this subject, I will give it cheerfully.

ARTICLE VI.

The Paris Exhibition.

Those of our readers who have not had the opportunity or inclination to visit this exhibition of European industry, will, like ourselves, be disappointed when we state, that with but few exceptions, there was scarcely an article exhibited belonging to the dental department, which could consistently be termed a "novelty" in dental science. In truth, we preambulated over and over again this huge building to discover the whereabouts of the dental instrument maker, but without success; it is true, we chanced to alight upon a *surgeon's* instrument maker's stall, which contained circular jointed forceps. The instruments or tools found at the other stalls, were of the most antediluvian character, consisting of forceps, the old fashioned key and punches. We could nowhere discover the splendid exhibition of dental instruments by Chevalier or Arnold, of America, or Dixon & Everard, of London. In fact, we almost began to doubt whether the exhibition contained things dental, had we not been attracted by a huge imitation of a set of carved ivories, and a profusion of ornamental address cards and *professional* circulars. As a matter of course, we were prepared to expect the "Gallic Cock," to have been upon a par at least with England and America in dental science, and we had also been led to suppose, from what has been said and written upon the subject, that in some things they might have stolen a march, particularly in one branch, mechanical dentistry; these impressions, however, were soon obliterated upon inspection. We opine, neither American or English dental practitioners have nothing to fear from the contents of the French exhibition, as far as regards inventions, style, finish or solidity of workmanship ; we are, moreover, inclined to think there is a vast deal more theory than practice, more shadow than substance, a common failing with the majority of the dental profession in all countries. There

were but very few exhibitors from either America or England, and a marked difference in the character and importance in the contents, when compared with the Londom exhibition; there was a perceptible want of Chevalier & Arnold's dental instrument stall, also Weiss, Everard, &c., of London. The contributions of these gentlemen to the London exhibition, formed a striking feature, not easily forgotten by those who really take an interest in their profession. The reason probably these exhibitors, and many others, did not contribute to the Paris exhibition arose from the gross neglect and breach of faith practiced towards them by the "council" of the London exhibition, who, in their voluminous report upon the contents of the exhibition generally, made no special mention of anything appertaining to dental science. This alone, we should say, was sufficient to account for the "barren" show by foreigners at the great Paris Bazaar.

We cannot conclude these remarks without according to Drs. Evans, Delabarre, Tucker, Page, &c., our most cordial and hearty thanks for the kind attention and politeness we received at their hands, there was a total absence of "*starch*" affectatation and presumption; there was not a particle of the bombast and egotistical conceit of the dental Mæcenas of Wimbledon; there was, as regards those gentlemen, indeed, a most *perfect* "absence of affectation or mannerism." They are, at least, modest, and retiring, and can well afford to let *others* find out whatever merit they possess.

Contents.—America.—No. 45. Messrs. Jones, White & McCurdy.—This firm exhibited at the London exhibition, and on that occasion we remarked upon the want of *tube* teeth for the "English market," combining their present exquisite shape and color. But Messrs. Jones, White & Co., are staid "old fellows," and have a mortal antipathy to any kind of innovation. Their exhibition case contains an immense variety of plate teeth, gum teeth and pivoted teeth, all of excellent quality, they are certainly very happy, in shape and color, in imitation of nature.

United States.—No. 46. Kingsley, New York. This practitioner has done the profession good service, in producing an

excellent imitation of decayed stumps of teeth in porcelain work. Also several cases of irregularities of the second denture. Allen's process upon platina.—This gentleman deserves the thanks of the profession, for the pains taken in producing such exquisite specimens.

48. Fowler & Preterres, exhibit specimens of materials used in the manufacture of mineral teeth, specimens of gold fillings. Allen's process upon platina gilt, finely executed.

No. 50. Ross, New York, American plate teeth, Allen's gum process and some very beautifully executed block work.

England.—752. Messrs. Ash & Co., a very fine assortment of tube teeth, exquisitely modeled in shape, they are not excelled by any manufacturer; we wish we could impress this firm of the necessity of a gradation of color, they appear as obstinate as their American competitors, who, as manufacturers, know as much of the niceties and requirements of the operating room, as an Indian coolley. This firm, in the spirit of the times, now manufacture teeth with platina tubes at a very considerable reduction in price; they are in shape and finish quite equal to the gold tube teeth. (We are happy to find *honorable* mention has been made by the "judges" of the exhibition, an instalment certainly for past neglect in these matters.)

762. Harnet, cements for filling teeth, a variety of specimens of mineral teeth, with compressed backs, admirably adapted for short teeth and close bites. Blundell's apparatus for applying cold as an anæsthesia in tooth drawing, manufactured by Messrs. Thornwaite & Co. The apparatus is excellently made, but its anæsthetic effects, when practically applied in operation, does not appear to have realized either the presumed inventor's expectations, (Blundell's,) or the foolish persons who have parted with £100 for the right of patent.

776. Young, *Scotland*, extracting forceps with shifting bits, requiring nine pairs for the extracting of all classes of teeth. Mr. Young, we perceive, has not *patented* his forceps, but if we remember correctly, the invention is not new, having been introduced some years since, at any rate, the mechanical arrangement is very simple, and would no doubt be serviceable to sur-

geons in the army and navy, who cannot stow away a multiplicity of tooth instruments; they are undoubtedly more ingenious in their construction, more applicable in practice, than a kind of forceps introduced to the profession by Mr. Maclean, at the Medico-Chirurgical Society at London, last winter, on which occasion a gentleman present (Mr. Vassey) remarked, that the forceps referred to, he considered, "improved tooth crushers."

3979. Bidart, gum teeth, and mineral blocks, good colors, but inferior shapes.

France.—3980. Messrs. Billard & Son, a large collection of mineral teeth, very inferior in shape and color.

3990. Capron, surgeon's instrument maker, exhibits a collection of badly made tooth forceps and German keys.

3998. Didier, a model of work shop, in which, we presume, some extremely inferior mechanical work exhibited, was manufactured.

4015. Lalemur & Robarts, a very ingenious and simple machine worked by the foot similar to a common lathe, for carving teeth in bone, also in alabaster, some very fine specimens of each were exhibited by an assistant who attended to illustrate the practical working of the machine; in action it is similar to Mr. Jordan's machine used for ornamental carving. Besquet, exhibits some of the finest specimens of carved teeth in the building. Also, imitation of irregularities in the centrals.

4017. Hasler, very inferior specimens of mineral teeth.

4023. Pierret, Brest, a variety of American drills.

4038. Dr. De Villemeur, plates mounted with teeth, and lined with gutta percha; also, a plaster cast representing the loss of the right maxillary arch, which had been supplied by gutta percha mounted with natural teeth. Obturators manufactured from the same materials. A few of Everard's adapted forceps, with circular joints, which the worthy doctor claims as his own invention.

4039. Weile, forceps for extracting teeth perpendicularly; a very clever invention for making spiral springs; also, a contrivance for securing pieces of mechanical work, in cases of large suction pieces.

4059. Cacau, a tolerably well carved piece in hippopotamus; mineral mounted upon platina plates.

10,101. Royer, the most inferior specimens of carved teeth in the whole exhibition.

10,104. Simon, exhibited at the London exhibition, 1851, on the present occasion, his handicraft is upon a *par* with his former attempt; a combination of badly carved bone specimens and old fashioned tooth instruments, representing the key and forceps.

10,105. Soieplet, old fashioned methods of regulating the second denture, with models before and after treatment.

10,110. Wissuer, this exhibitor not only gives us quantity but quality, in the shape of a set of teeth excellently carved in bone, about the size of a modern warming pan, also a smaller specimen equally well executed.

10,072. Gillet, anatomical *carving*, showing the canal and pulp cavities of the teeth. Bone teeth carved, and mineral teeth mounted; the anatomical piece of carving was very beautifully and accurately finished.

10,073. Gion, artificial work upon gold plates and mechanical methods of treating irregularities. Aarboville says, that he has a *patent* for rendering bone indestructible when inserted in the mouth, and exhibits specimens before and after insertion. A *patent* also for making and lining the sockets with mother of pearl; in fact, he appears to be a compound of bone, mother-of-pearl and parchment deeds. Dr. Auroux, exquisite specimens of the teeth of man and horse in wax; a specimen of the new metal aluminium. Desirabode, some very choice pathological specimens of ossific union of the permanent teeth, centrals and molars, exostosis, &c., a case set round with crowns of teeth, perpendicular extracting instruments, teeth mounted upon gold and bone sockets. If publicity be of any service in making a practice, we are certain that Mr. Desirabode must absorb all the patients visiting Paris, for it must cost him a decent fortune for show cases and address cards distributed to passing pedestrians.

R.

ARTICLE VII.

Platinum, or Continuous Gum Work.

DR. BLANDY:

DEAR SIR—Your favor of the 27th of December, was duly received, and in reply to your inquiries relative to the meeting of dentists, held at the Dental College in Philadelphia, on the evening of the 8th of December, I would state that the discussion upon that occasion respecting the platinum or continuous gum work was very limited. The object of the meeting was not to discuss its merits or demerits, but simply to place before the dentists of Philadelphia, specimens of work which carried with them more convincing arguments than weeks or months of discussion could have effected. Two years of experience in this style of work, with results that have far surpassed my most sanguine expectations, led me to believe that it was yet in its infancy. And learning from Dr. John Allen and others, that but very little of this work was being done in that city, (a city, too, that can boast of the best block workers in the world,) it occurred to me that this place should participate, with others, in bringing to greater perfection the work over which Dr. John Allen has spent years of anxiety and toil, and which now bids fair to amply repay him, (if not pecuniarily,) in the consciousness of being instrumental in placing before the profession a work unsurpassed in natural appearance to any other method yet known.

I accordingly conversed with Dr. J. L. Clark, (who was at this time staying in New York, and whose professional abilities I highly esteem,) with the view of bringing the subject more especially before the profession. The result of which was an interview with some dentists of Philadelphia, among whom was Dr. Elisha Townsend. The meeting of the 8th was determined upon, and well attended by the dentists of Philadelphia. Dr. Townsend stated the object of the meeting, and introduced Dr.

Clark and myself. Dr. Clark stated that his experience in the work warranted him in recommending it to the careful investigation of the profession, notwithstanding the great barrier (patent right,) which seems to retard its progress.

I was also called upon to exhibit several specimens I had with me, which I am happy to say gave, as far as I could learn, much greater satisfaction than we had anticipated. Upon the points of beauty and natural appearance, there appeared to exist but one opinion, but in regard to durability and the greater weight which must always exceed the old style, there was the same opinion that exists in every mind that is unaccustomed to it. Upon these points I stated, what I now state in this letter, that a set of teeth, properly put up and with a perfect fit, upon the continuous gum plan, exceeds all other modes in point of strength, cleanliness, beauty and natural appearance.

Yours, with respect,

W. B. Roberts.

New York, *Jan. 5th,* 1856.

REVIEW DEPARTMENT.

ARTICLE VIII.

Are all Men, Men, or are they something else?—Types of Mankind. By J. C. Nott, M. D. Mobile & George Gliddon, Philadelphia, 1854.

It so happens that we have not sufficient matter of a truly professional character to occupy the pages of the present number of our journal, and we are, therefore, at liberty to bring before our readers the highly interesting and important topic discussed in the bulky volume above indicated, which has attracted much attention and passed through several editions.

The identity and common origin of the human family has, until recently, been very seldom called in question. Men did not dispute each other's title to manhood, however little they governed themselves by the kindly considerations which should be generated by consanguinity. Sometimes, to be sure, a restless speculation in things suggested that the Europeans were a little too familiar with other folks, and had been a little too fast in admitting Africans and Asiatics of certain hues and shapes, to the honors of technical fraternity, but the imitation was not regarded as worthy to create a serious suspicion of common humanity. People have long since been accustomed to hear foolish things from philosophers, and so they were contented to admit, theoretically, all races of men to the right of brotherhood, being only careful that none of these rights should be transmitted into practical proportions in good, or exemption from evil, further than it might be convenient for the dominant class to grant the one or remove the other.

Recently, however, there have been repeated and persevering attempts to unsettle the quiet of an opinion on this subject, and the huge volume, whose title we have quoted, is the result of a coalition of three scientific gentlemen, to affect, if possible, this very desirable end, that men, now not loving each other as brethren, may hereafter hate each other as brutes. Messrs. Nott & Gliddon are the manufacturers of the book. The late Dr. Morton, of Philadelphia, is made to contribute largely to it. Prof. Agassiz lends it the credit of his name, and encumbers it with a very presumptuous and shallow essay to prove the existence of some mysterious law, independent of climate or known determining causes, by which certain varieties of men, brutes and vegetable productions are marked off and associated together, on the face of the earth. Dr. Patterson contributes a biography of Dr. Morton, and lastly, but not least, Mrs. Gliddon furnishes the illustrative drawings, which we are compelled both by gallantry and truth, to pronounce the best part of the whole performance. Besides all these contributors to the material of the book, Mr. Gliddon acknowledges the assistance of several friends, who jointly and severally, afforded him import-

ant aid in putting what he had to write, into good possible English; a friendly act rendered necessary by a peculiarity of Mr. Gliddon, with whom, as he informs us, "style is ever subordinate to *matter*."

We cannot pretend to review this conglomerate in the few pages we can devote to it; we can only point out a few of its many errors and imperfections, and express our opinion of its design and character.

We do not know whether we ought to consider the work as one of physical science or theological controversy. The subject might certainly have been treated as one purely physical. The writers might have confined themselves simply to collecting and grouping facts, and reasoning calmly and closely from the phenomena before them, leaving their deductions to work out their own consequences as other truths, or to be exposed and cast aside as other errors. As they chose to avail themselves of records and traditions, they might have consulted the historical scriptures, and given their testimony such weight as they in their associate wisdom, should have determined. Messrs. Nott, Gliddon & Co., might have been respectful to the opinions and faith of the people for whom they wrote, and yet have presented all the treasures of their knowledge, as exhaustively and effectively as they did. They have chosen to do otherwise. They have preferred to make their work a formal attack upon the authenticity and authority of the bible. In their enthusiastic egotism they have made haste to announce their hostility to that venerable book, and they appear before the public rather as the champions of Deism than the expositors of nature.

As Mr. Gliddon has resided for a long time among the Turks, we are not surprised that he has learned some infidelity, especially, as notwithstanding his pretensions, he does not seem to have learned much else. If we cannot then excuse Mr. Gliddon, we can, at least, make allowance for the unfortunate circumstances of his life, but the other parties to this unholy alliance are inexcusable, if not for unbelief of christianity, yet for their hatred against it. As a sample of the temper with which Dr. Nott approaches a physical investigation, read the following paragraph.

"On former occasions we had attempted to conciliate sectarians and to reconcile the plain teachings of science to theological prejudices. In return, our opinions and motives have been misrepresented and vilified by self-constituted teachers of the christian religion. We have, in consequence, now done with all this, and no longer have any apologies to offer nor favors of lenient criticism to ask. The broad banner of science is herein nailed to the mast. Even in our brief day we have beheld one flimsy religious dogma after another consigned to oblivion, while science on the other hand, has been gaining strength and majesty with time." Mr. George Gliddon is equally warlike, while Dr. Nott "nails his colors" to the mast, and lets his saucy craft career freely over the ocean to the jeopardy and at the proper risk of any "flimsy dogma" that may venture across his bows. Mr. Gliddon announces his purpose to "carry the war into Africa," the land where he learned to fight. He avows his cruel resolution to pursue christianity "even to the death," and informs us at last, that besides the stabs he has administered by this volume, he has three hundred pages kept in reserve. These he calls his "powder," and tells us that he is "keeping it dry" for a final bombardment of christianity. If it shall prove "drier" than the pages he has already printed, the reading world is indeed threatened with no ordinary evil.

The design, at least one design of the book is, to controvert christianity by "science," in other words, to show that the teaching of revelation is contradicted by visible facts, and, therefore, cannot be true, and especially that the fundamental doctrine of the bible which regards mankind as a family, derived from one pair, Adam, and subsequently from the one family of Noah, is erroneous.

We will not dwell upon the important moral and religious bearings of the propositions stated by the collaborators of this volume; we are willing to consider the question of the identity of the human race as a purely physical one. If men are not of one blood; if they are descendants of progenitors originally and primordially distinct, if the distinction be perpetuated by definitive organization, then we will give up the bible, and adhere to

Mr. Gliddon. We only ask that the facts be clearly and satisfactorily made out. This done, and infidelity has triumphed; and the European race take the place of God in the earth.

We will pass over the essay of M. Agassiz. It is the assertion and defence of a mere conceit, and is scarcely worthy of examination. It is contradicted by every thing and every body, and even by M. Agassiz himself, for, in admitting the identity of the great American race, from the arctic circle to the equator, he virtually admits that his whole speculation is nonsense.

M. Agassiz having delivered his argument against the original unity of the race, and insinuated that men, so far from being cosmopolites, are assigned by few of original creation to certain geographical districts. Dr. Nott and Mr. Gliddon proceed to divest the public mind of the vulgar error, that men originally came from Asia, and to show that the notion of unity of races is a comparatively modern conceit, altogether absurd, never having been conceived by any primitive nation, such as Egypt or China. They think it was borrowed from the Bablyonians, or from the Buddhists, or somewhere else. *They do not find it in Genesis*, and if they did, they consider Moses very indifferent authority for anything. They would consider the sarcophagus of an Egyptian of Moses' day, unimpeachable evidence of anything they might spell or suppose themselves to spell out of the hieroglyphics on his mummy case, but they have no faith in any old writing more distinct and intelligible.

Dr. Nott asserts, that "There exists a genus Homo," embracing primordial types or species which have remained permanent and untransitional, through all recorded time, and despite the most opposite moral and physical influences. From this fact he argues that these species always were distinct, and that men were originally created in nations, separate and distinct from each other.

The argument for this bold assertion, not by any means modestly stated, rests mainly upon the antiquity of the Jewish and Negro lineaments, as affording types, least confused by mixture and best attested in antiquity. The Egyptian monuments furnish the pictorial testimony to the fact, that in the

days of Egyptian lithoscripsy, the Jewish features were formed and recognized as typoidal of the Abrahamic family. From this it is inferred that these features *always* so existed, and that they are the result of primordial organization, constituting a specific mark for the Jewish creation.

To this we have several objections.

First, we cannot admit that the identity of the Jewish features are so clearly made out by the Egyptian monuments. The process of reasoning upon these Abrahamic portraits is rather too circular to come to an end. All the Jewish looking faces are first judged to be faces of Jews, and then the Jewish face is concluded to have been always peculiar to the descendants of Abraham. Now we will venture to assert that neither Dr. Nott nor Mr. Gliddon can distinguish a Jew with anything like accuracy. That there is a certain peculiarity of countenance common among the Jews is true, but it is not at all uncommon among gentiles, and when necessary to a theory it has been found equally prevalent among American Indians and Affghans. We know Americans who are much more like Jews than many of the Jews are, according to Dr. Nott and Mr. Gliddon, and we doubt not that many of our Saxon race would be referred to the Judaic creation, were their profiles examined by our "scientific" authors, with as much discrimination as those of Egyptian portraiture. Some of the kings and queens of Egypt present the features assumed to be Jewish; hence, without more ado, they are declared to be Jewish, and hencc the Jewish face is declared to have been peculiar to the Jews in the days of the royal personages presenting it. The very contrary is in fact the prima facia suggestion. We would not look for Jews on the Egyptian throne, and, therefore, we should infer that the countenance assumed to be peculiarly Jewish, was occasionally met with among the Egyptians, just as it now is among the Europeans and Asiatics, and, therefore, was then as now, not a peculiarity at all, though more common among the Jews than others. To say the least, this appearance of the Jewish face on the Egyptian monuments, should not be relied on as an argument for the typical import of it. But there are other diffi-

culties about this Jewish face. The Jews are of comparatively very recent origin. They date only from Abraham, but we suppose that "science" does not pretend that the "nation" was then created. Abraham then was but one man of a nation, all having "Jewish" faces. It is to be supposed that if this one man propagated a nation, and diffused the face through them, other men of the nation did so too. An enormous multitude, then, among whom the Jews are but a handful, must have inherited the "face." How then did it become distinctive of Abraham's family? If all the rest lost the "face" by intermixture, then certainly this "type" of race has none of the "permanency" about it which marks species; again, had there been no intermixture before Abraham's day? And, if there had been, why may not the "face" be a result of mixture? Who shall say that it was the stamp of the original progenitors, and not an accidental inheritance from more recent ones? We can readily perceive that a bold outline of countenance might be impressed by a parent upon his immediate descendants, and that they by intermarriage might perpetuate the family likeness. We see that this does occur among the lower animals, and even in the human family it has been observed, as in that of the reigning house of Austria. We do not perceive why this family resemblance may not be diffused as widely as the family: as widely, at least, as it diffused among the Jews, a great number of whom are entirely indistinguishable from the people with whom they dwell. Be this as it may, it is certainly a violent conclusion that what we call national peculiarities of feature, are really specific marks of distinct human creations. The features of the Irish, Germans and Italians are quite as well defined as those of the Jews; yet we are loth to believe that these several people are indigenous to the countries where we find them. All these faces disappear in America in two generations and pass into another, from which some future Gliddon may satisfy the scientific world, that we were all indigenous to these lands, and that like Topsey, "we wasn't born,—we grow'd."

The negro face is of course brought prominently before us, to show the permanence of the type, and the impossibility of common origin.

This peculiar countenance is found upon the Egyptian monuments assumed to be of a date 2400 years before Christ, hence it is argued that the negro face always existed since the creation. This we protest against, as an outrageous non sequitar. It amounts but to a demonstration that negroes, whether many or few, were found in those days. We by no means admit that the Egyptian chronology, or the professed interpretation of it is correct. At most, the chronology of the monuments can claim to be only probable. Great blunders have been made, and no doubt are yet made with regard to the age of these monuments, but admitting with Bunser and Leipsius, that the old Egyptian monarchy dates at 3893 B. C., we have an interval of fifteen hundred years in which no negroes can be found. Mr. Gliddon admits into his work a *fact* and inference which proves the human race to be more than 57,000 years old. With what propriety then can he talk of the antiquity of the Egyptian monuments? These records are recent, absolutely of more modern date compared with the 50 or 100,000 years preceding them. Suppose negroes did exist a few days ago when the Pharaohs and Moses lived, what of that? We might as well argue that the hairy woman existed from eternity, because her likeness has been exhibited for a year or two, as to infer that because negroes existed four thousand years ago, therefor, they existed for interminable ages?

We opine that Mr. Gliddon knows very little about Egyptian antiquities, further than is sufficient to enable him to distinguish the sex of a mummy after it is unrolled. Bunser and Leipsius probably knew a great deal more, and they both are firm believers in the unity of our race. Had the Egyptian monuments showed any thing to the contrary, they would have told us so. Until they shall do so we must be excused from confiding in Mr. Gliddon.

The permanency of the North American Indians is shown by observations made at an excavation in New Orleans, when a skeleton of a man was discovered at the enormous depth of sixteen feet in the alluvial mud, the cranium being under the roots of a cyprus tree. From these data it is elaborately ciphered out

that the skeleton aforesaid was alive upon the earth 57,000 years ago, and was then an American Indian! This information is furnished by Dr. Bennet Dowler, who has thus proved not only the longevity of the Indians but the indestructibility of their skulls, and in so doing furnished a much more *permanent* mark of specific difference between them and other folks than any before suggested. Well may a reviewer in the Southern Quarterly Observer, make "inferences" founded on a calculation so totally in conflict with the known progress of history and human development; with the mature convictions of Lyell, Murcheson and the soundest judging geologists; with the comparatively recent dates of the oldest recorded astronomical calculations; the most ancient of which ever heard of, Laplace tells us, in his System du Mordi, are some rude Chinese notices of eclipses 2000 years B. C., and the first that can be relied on at all only 1100 B. C., and with the limited range of even Egyptian chronology are too preposterous to require serious refutation.

If we observe the lower animals we find that every species, though carefully guarded by a natural law from being confounded with others by admixture, is capable of developing many, and under favoring circumstances, permanent varieties. The domestic animals are familiar witnesses to this fact. The hog in his wild state is more different from the hog domestic, both in shape of skull and other peculiarities than the Hottentot is from the Caucasian. Turn the domestic hog loose into the forests, and he returns to the original type. Wild dogs do not bark, the domestic dog turned loose, ceases to do so. Domestication begets a variety of colors which are lost when domestic animals become wild. The sheep becomes hairy in hot, and the horse woolly in cold, climates. Yet in all the changes observed in the lower animals we perceive nothing which invades the limits of species. The wild hog is as evidently a swine as the tame one; the wild horse as the tame one, and there is nothing in all that we observe of the occurrence and permanency of varieties among them to interfere with the opinion that originally they were from one pair.

With regard to mankind, it is evident that within the limits

of species there is freedom of variety to a great extent, and that among them, as among other animals, varieties may become permanent. Black color is no longer considered peculiar to the African race. How it originated we cannot tell. We do not know the circumstances which in early ages affected the human family, nor how soon its tendency to develop permanent varieties may have reached its ultimate limits, and in some respects, perhaps been exhausted. "It follows from many facts," says Lyell, "that a short period of time is generally sufficient to effect nearly the whole change which an alteration of external circumstances can bring about in the habits of a species." Mr. Gliddon, however, has furnished us abundant time for any thing to be done which time can do, for he has given us at least 50,000 years, with the privilege of as much more if necessary. Now, admitting that the human race could develop permanent, or at least not easily eradicable, peculiarities, we ask Mr. Gliddon why the red, black, yellow and white varieties of mankind may not have been formed about the year 25,000 before the oldest Egyptian monuments?

Why seek the specific marks of man, in the form of his bones and color of his skin? Evidently his animal nature is the least distinctive part of him. His mind and soul are the grand and glorious peculiarities of his race. These separate him from the brute creation by an immeasurable gulph, while his animal nature almost identifies itself with theirs. In examining claims to manhood we should test them by the intelligence and the passions. Does he think? Does he hope? Does he love? Does he fear? Has he opinions and sympathies? Can he do good and evil? A tear or a smile, or a word; are not these fuller of meaning than the arch of the brow or the swelling of the lip or the hue of the skin? Mr. Laurence once ridiculed the idea of African missions, upon the ground that the formation of the negro skull would be an insuperable barrier to conversion. Nevertheless negroes have been converted with much less effort than was bestowed on Mr. Laurence. Are we to infer then that the insuperable difficulty was in his Caucasian cranium, and that he was an infidel because his head could not contain

the dogmas of christianity? If we were to reason as loosely as Mr. Laurence, Gliddon and Nott, have done, we might come to this conclusion, or any other, so only that it should be absurd.

This huge volume will not turn the world upside down. It is by no means a formidable antagonist to christianity. A little knowledge is a dangerous thing, to little people. It produces a swelling about the head, which is too often mistaken for cerebral enlargement, when it is really a mere expansion of brain with diminution of density. Some men have industry and perseverance, and a certain facility in collecting facts; and these make good and useful naturalists, so far as they content themselves with gathering materials for thought. If they attempt to philosophise on their observations, they not uncommonly make a sorry exhibition of their intellectual powers. Unfortunately it is not unusual for men to confound what they know, or think they know, with "science," and claim for it a decisive preponderance in all comparison of opinions. The authors of this work speak as dogmatically and authoritatively about "science," as though it consisted in a very partial knowledge of physiology and history, eked out with the scanty Egyptian pickings of Mr. Gliddon and the magnificent mud rakings of Dr. Dowler. If what these gentlemen have published be "science," it is a very simple thing. Chronology is the result of a sum in multiplication worked out by Dr. Dowler on a few square inches of slate. The most important problem in the natural history of man, is determined by the observation of Jewish looking profiles on an Egyptian monument. The appearance of a negro countenance on a stone, guessed to be 4000 years old, is the "science" before which all the evidences of the christian religion are to go down. The opinions of the ablest geologists, naturalists and archeologists, astronomers, and philosophers are all to be set at naught by the wonderful discoveries of Drs. Nott and Gliddon, who yet have discovered nothing.

Jericho was overthrown by a blast of rams horns, but the manufacturers of this book have essayed to do more with less means.

SELECTED ARTICLES.

ARTICLE IX.

Lectures on the Duties and Proprieties of the Dental Practitioner. By Prof. E. Townsend, D. D. S., Philadelphia.

At the meeting of the American Society of Dental Surgeons held in Cincinnati, 8th and 9th of May last, Dr. E. Townsend, by special request, delivered two lectures which he had prepared for the dental class in the Philadelphia College of Dental Surgery, on the duties, proprieties, courtesies, &c. of the dental practitioner.

Many members of the Mississippi Valley Association also then present, joined in a request with the members of the American Society, that the lectures be published in the Dental Register. In accordance with this request, Dr. Townsend has kindly furnished us a copy, and we feel that the intrinsic excellence of these lectures on a subject so important, is more than sufficient apology for occupying so much space with one article in the present number of the Register. These proprieties of professional life are important not only as necessary in consulting the feelings of our patients, but a neglect of them gradually blunts our better sensibilities and renders us incapable of appreciating those feelings which are the result of a correct taste and fine education.

The man who is slovenly and dirty in his person, and loads his breath daily with the fumes of alcohol and tobacco, will soon be unable to appreciate the finer sensibilities of the cleanly, who cannot but wish to avoid a too close proximity to that which is so offensive.

To the young practitioner, whose aim is *success*, these lectures will be of incalculable service. They come from one who

has been long enough in the profession to realize and profit by the adoption of that which he recommends.

An uncouth manner, a dirty hand and napkin, and a foul breath, has impoverished many whose scientific qualifications might have insured success.

Gentlemen:

The Chair I have the honor to occupy, and endeavor, as I best can, to fill, owes to the class which honors its officer with their respectful attention, both duty and respect.

These obligations belong to our professional relations, independently of those personal regards which arise out of the very pleasurable intercourse necessarily subsisting between us.

This intercourse and intimacy, now near the close of our first session so well established, I am happy to acknowledge for myself, and to believe for you, have strengthened and deepened the feelings which the rules of etiquette between teacher and pupils, are designed to recognize and maintain.

Especially happy am I in the assurance which I feel, that every proper discharge of my duties will receive in your minds the kindest construction its faithful frankness may perchance demand.

I have no right, and I shall never presume upon my privileges of position to speak to you upon any topic, nor with any purpose, nor in any manner from this place, other than belongs legitimately to the chair which I hold.

One branch of this, my duty, cannot be divested of such personality as attaches to the application of the abstract principles of professional conduct to the practice of those who are about to put themselves within the range of their requisitions.

To the chair of practice of surgery, and of obstetrics, in the medical colleges, belongs of right the duty of suggesting the proprieties of professional conduct and demeanor in the sick room, and in the general personal relations of the practitioner to his patient. The teachers of these departments speak without hesitation to their pupils upon this important topic, and I have the warrant of their example, as well as of the reason and justice of the thing, for the similar duty of calling your attention now

to the equally important matter of the dentist's personal relations to his patients, the decorum required, and the influences exerted both upon himself and upon them.

I do not suppose that rules covering all the points involved can be definitely laid down, nor that I am capable of delivering the oracles of a perfect demeanor, in all the circumstances deserving to be considered and provided for, but I will not decline the task because of its difficulty, or leave unattempted a duty so important on account of its delicacy. That which may be clear and just, will commend itself to your good sense, that which may be lacking you will endeavor to supply, and the decision of your own judgment and taste must be your protection from the mistakes of mine. I assure myself, that however this difficult and delicate duty may be performed, good must come of the hints and helps which shall put us all upon inquiry in matters of such importance as these. Do me the justice, however, I beseech you, to receive my thoughts as wholly impersonal in my intentions, and, do yourslves the justice to make them personal, so far as they are worthy and can apply; but, all at your own risk and responsibility. You are entitled to my opinions, to the results of my experience and reflections, and, you are also entitled to your own proper liberties in judging and accepting them. I speak *to* my subject, not *at* my audience, and you must think only of what I say, and what that may suggest for your own guidance and government, and not of the speaker as of a personal acquaintance. A generous confidence will give me my proper freedom, and will afford you whatever benefit can result from its frankest exercise.

Although I have used the precaution, before entering upon this delicate and debateable ground, of taking more care of the forms of expression than extemporaneous composition secures, I freely confess, I have not been able to construct a code, or arrange an essay, with the fullness and accuracy which the subject demands. But the impulse and the obligation are alike upon me, and I must do what I can, as well as I can, caring more for the substance and effect of my remarks, than for their systematic symmetry.

Added to all the intrinsic embarrasments of my undertaking, I am obliged to find my way through it without the assistance of any guide which I can make available in the route to be pursued, and I proceed therefore with the caution and doubtless much of the irregularity of one who must *explore* a wilderness while he pursues his journey. Enough of hesitation, explanation and apology. Let us turn to the subject, or subjects which we are to consider."

First of the office: ante-room, furniture, reception of visitors, and their accommodation and entertainment, generally and particularly; or as the lawyers say: "of property and appurtenances, real, personal and mixed."

The general character, the location and style of your residence must of course be governed, at least limited by your means, when *they* are limited; if funds or credit abound, substantial elegance governed by good taste cannot well run too high. The gentlemen and his banker must settle these outlines, and make the best compromises, which any particular case requires.

Economy is a virtue and duty as well as necessity, but style is a good investment in our business, and an important and productive part of the stock in trade, much of our work is a matter of appearance to our patients, and our establishments should be in good keeping with the sentiment which they are concerned with. The properties and appointments of art ought to be artistic and attractive. These harmonies are more felt and noted than inattentive people are apt to imagine. The office or operating room, is more within control and its proprieties more nicely exacted, than those of the general edifice.

It must be as little like a workshop as possible, and it must not in any degree be converted into a lumber room. It is not the place for a convention of horsewhips, old boots, shot guns, pamphlets, fragments of the last lunch, and ingenious rat traps in progress of construction; nor must it look terrible, for the sake of looking imposing in its array of instruments of torture. Display in *itself* is a vulgarity; in a surgeon or a dentist it is barbarous.

The bee hides his sting till he must use it; and the snapping

turtle who uses *his* forceps rigorously enough upon occasion, knows how to shut up his case, and they are both all the more beautiful and amiable for such consideration. Monstrous three or four fanged molars handsomely extracted, are trophies of skill to be sure, but they are a regular nightmare to the unhappy wight, who may have one aching in his jaw. Keep your tools out of view, a well constructed case will enable you to do this with a turn of your hand, when you are not actually using them, and place it so that your person will hide most, if not all of it from your sitter in the chair ; and let no sign of bones and blood oppress the sight or shake the nerves and offend the feelings of your patient. A patient of mine within a few weeks left an expert operator, because she saw blood on a pair of forceps, which she believed had been thus coated when used in her own mouth. She could endure any reasonable amount of pain like a soldier, but she did not relish the sight or taste of other people's blood. Your office should have the air and arrangements of a parlor, or of a boudoir as nearly as possible, and be kept scrupulously free of the associations arising out of its daily use, and offensive service. Its furniture should be rich, neat, simple, and free from an encumbring quantity ; two chairs, at farthest, with an ottoman, and a centre table for books for the entertainment of company. One washstand for your own use, but no jumble of tooth brushes of your own, or other utensils for lazy convenience, when patients are absent. The office must be dedicated to operations, and guarded against all other uses. It is no place for pictures of yourself with a set of teeth in your fingers, or mantel piece arrangement of artificial teeth, grinning like dissected jaws at those who are only too conscious that their own are to be cut and carved after a pattern. One fine bust of *ideal* beauty, or one superior picture in the line of the sitter's gaze when in the chair, may be effective and proper, but be sure that it *is* a fine one. Of all things be sure not to show bad taste in form and style of your ornaments.

The like principles of taste and propriety should govern the order and arrangements of your ante-room. In summer it should be supplied with fans, which should be neither mean nor ab-

surd; nothing flash, and nothing beggarly about them. The books on the stand and center-table should be of standard authors. Not exactly those that are on every table in town. The last history of the world, and "the rest of mankind," the newest novel, nor the most elegant trumpery of the last holidays. It is not the place for the city directory, nor a patent medicine almanac.

There are enough of works of *classic* authors, whose names every body knows, but few read, except those who pilfer from them for the best things in their own original productions. Lay a few of these within reach of persons who fill up all their time with wet newspapers, and uncut cheap editions of the last agonies of literature, and they will *remember* the minutes they spent in waiting, and connect you with a rich enjoyment and a good impulse ever afterwards. Dont let book-hucksters dictate your reading, and help your friends to a hint of better things.

There should be no dentistry or surgery in this ante-room, either in books, pictures or crockery. There ought to be no particular, especially no peculiar, or partizan drift in the provision of books. If you *have* a hobby, never solicit any body who comes to you professionally, to ride it; bore your friends, for, they bore you in turn, but let other people alone; newspapers, tracts, memorials, petitions, and all sorts of contribution boxes are to be banished from this chamber, and with them all the impertinence of sects and isms of the day. Your patients suffer enough in their teeth, without having these things thrust into them, or along with them. Provide works which will serve to pass the time of waiting for almost every class of persons or of mind that may need such pastime. Let them be rather above than below the level of mediocrity. Let it be your habit to *level* up in all things, not down: You will thereby preserve and mend your own tone of life and thoughts, and impart while you impress it upon others. The effect will pay every way. Out of such things arise those regards and respect which dignify life, and give personal character, command of criticism, and authority for all useful exigencies. The idea that runs through these suggestions is, that you are to be a gentleman as well as

a dentist, and you are to fortify yourself in that position by all your surroundings, and deepen its impression by every condition of your professional life.

Servants should be trained to receive visitors with politeness; and the politeness of such service is not mannerism and flourishes, but promptness, alacrity, and precision, with earnest respectfulness. A servant should not be servile, that spirit is too mean and cheap to be agreeable to others, or creditable to yourself. A respectable man is indicated by respectable as well as respectful domestics. It is a fact that they always reflect the manners of their employers, or indicate them to a quick eye by the demeanor which is exacted of them. They behave to people at the door, as he would do, or else they show the falseness which he requires of them for his own purposes. Such unveracity is concealed from no body that is *worth* deceiving. It takes an artful man to play his own tricks successfully, *he* always fails in the long run; and servants are *sure* to bungle and expose them. Let no man ever take such assistance into any of the little frauds and conspiracies of habitual evasions and hypocrisy.

Have a bell in your office which a servant can touch in case of a call while you are engaged, to prevent knocking at the door, and the delivery of messages and *names* in the presence of your sitter. Besides the importance of avoiding disturbance, at perhaps a critical point in an operation, it will answer another excellent use. Patients are sometimes very *im*patient, and persons having business, like to be dispatched, because they come, not to wait an appointed hour, or to take their turn when an interval occurs. Such persons after waiting a few minutes will ring again for the servant and request you to be re-informed of their presence. Let the servant repeat the signal, or assure the party that you will answer without any avoidable delay, or let the one intimation be the rule, and the servant retire without either promising or refusing to repeat it. You must do justice to all parties. The sitter has his claims, and they are first in order. You are the best judge of rights and proprieties, and you will never lose anything by doing just right. If you observe your own rules, your household will do so also,

and all your sitters will learn to respect them, and to conform for the sake of their own interest in them. You will save your own temper too, for men are seldom impatient of things that they know how to defend themselves against. A little breeze does not disturb a sailor, if his ship is in trim,—all taut, the ropes in order, and the helm in his own hand. Dont break your own rules, and then fret because they are broken. Nor are you to be the slave of rules, either. If they are well made, they need not be so stiff as to lose all accommodation to exigencies. The magnetic needle fluctuates under disturbances, but is true, all the while, to its polarity, it always settles to the right point of the compass, and the sailing is as safe as if it were in a bee line all the time.

Convenient accommodations should be provided in the hall, if possible, for coats, umbrellas, overshoes, &c., for gentlemen, and for ladies, in a room contiguous to the office. Never furnish any place with comb and hair brush. Dont allow any body to believe that you think such a practice cleanly. You cannot give a new one to every visitor, and you might almost as well offer the loan of a tooth brush, or do as I have known to be done—scour their teeth after other operations were completed, with a brush which had done the same service in many another mouth before. I limited the chairs in the operating room to two, because the presence of a single friend *is* sometimes admissible or even desirable. *One* witness of an operation is enough, more are troublesome to the operator, unless he can effectively play off one against another.

But we seldom find people who can keep their hands to themselves, and as seldom those who can use their tongues without injury to our patients, and our own management of them. I dont say that a dozen of the right kind of persons would be too many anywhere, but I dont suppose *half* a dozen will ever meet in any operating room. The effect of witnesses upon patients varies very much. Sometimes you will find it best to request your patients may come to you alone, to have the best success. This for various reasons. Some people, mothers particularly, are very injudicious in their sympathy, and often

behave in such a way as to make the child feel as if he or she were enduring something very horrible, with worse to come; and, therefore, may well be excused for some fuss. Others, with as bad policy, and as little judgment, will not allow any expression of distress and fear, or any shrinking from pain, for fear of a total failure of the operation. They either cannot judge, or do not consider the truth and right of the case, and so their influence, unjustified by the child's own feelings, is good for nothing and worse.

Either of these extremes is bad for the patient, and the dentist, if he is skilled in the management of his subjects, patient in his own spirit, and properly considerate of the circumstances of the case, will know how to adjust himself to it, and will do it most successfully, in the absence of incapable friends. He will know how to be gentle and sympathizing where it is due and expedient, how to be rigid and determined were such a demonstration will supply the lack of courage, and steady the patient's resolution. His practice should make him familiar with the ropes, and undisturbed he ought never to fail, and seldom will. His little sitters alone with him, relieved from the presence and influence of those, who mayhap, have done him a thousand other injustices by their mistakes, whose weaknesses and faults he knows and counts upon better than they think, will, in the hands of a judicious practitioner, whom he supposes, knows every thing, and is just and kind, be like a puppet to be played with at will, for their own best advantage. Indeed, the operator may give children such lessons in conduct, and such an experience of self-government, as will render them yeoman's service for the rest of their lives, in matters of a different kind, and of higher moment. It is often in the least considerate events of a young life, that the impulse and direction of its after history is to be found. Think of these things as well as of your strictly professional duties and interests.

Conversation is about as difficult as dentistry itself. Teeth and tongues are not very easy of the best management. The sitter's tongue you have your own way of holding for him. Over his friend's you have less control, and then, excuse me,

there is your own to manage, and I have something to say about that.

It is safe to say, that all conversation during your work and its little intervals, should be upon general topics, as far from plugs and nerves—particularly the nerves, from files, forceps, and flash operations as possible. *They* are near enough in *fact*, without being intensified with *talk*. The theme should never be upon the operator's own manner of performing his manipulations, and his superiority over all others in the known world. No doubt it is all very wonderful, but then every body knows you think so, and you can spare the brag and open egotism of it, without any danger of being charged with undervaluing yourself; and what is far better, you will avoid that most unhandsome, and most foolish practice of undervaluing other men in the profession. It is best as a rule never to lecture either gossip or professor fashion to your patients about their cases, or anything else in your own art, unless they desire information which it is proper for you to give them. The accomplished dentist should so store his mind with the general knowledge belonging to a gentleman and a man of science that he shall not need to be, on all occasions, in season and out of season, talking of his calling.

When direct inquiry is made, let him remember that it is practical information the patient needs, not a fourth of July oration, or a flourish of words and scientific terms and phrases, to display his erudition. Ardor and zeal in the study and improvement of one's profession is apt to lead him beyond the boundaries of good taste in talking about it. Guard yourselves well there, and especially remark, the use of technical words discovers rather your estimate of them and their supposed effect upon others, than your own deep and familar acquaintance with their significance and proper use. Well grounded and habituated thought is not so fresh and green, or so new fangled as recent and imperfect discoveries show themselves. Remember that all pretence is vulgar. Avoid the very appearance of it.

As a general rule for your demeanor and style of address and conversation to your patients, especially to men, profes-

sional and unprofessional, distinguished and unknown, gentle and simple, bear in mind that science and art, like religion, is no respecter of persons. A physician, surgeon, or a literary savan in the chair *is* your patient and nothing *more;* a gratis patient or a servant is your patient and nothing *less*.

Such accommodation as adapts your bearing to all varieties of men is of course required in all kinds of communication, but take care of anything beyond this, anything with a different object and aim. One of the worst mistakes a dentist can make is to talk flash technicalities to a medical man. If he is not a snob, he wants no such display, and if he is, he wishes to display himself, and you will make nothing in such a contest. If your sitter is an ignorant person, or what is the same thing, ignorant of anatomy and physiology, he already credits you with knowing your profession, and, if he is a man of general culture, he has a quick sense of the proper bearing of a cultivated mind and its self-balanced dignity. He has seen enough of *astonishing* people, and enough of egotism, and he knows their measure and meaning. As you are not to flatter a distinguished sitter, so you are not to fear him. Is he a first class surgeon? No matter. He may not have a tythe of the skill in his art that you have in yours, and if he has, he of *all* men best knows the deference *due* to every man in his own calling. There he is, a man simply, with the tooth-ache, unable to help himself. There you are, a dentist to treat his case. Take your own position and keep it. When he asks you for a reason, or a prognosis, give it to him, respectfully, modestly, but in the fashion that asserts your own right to settle the matter. If *he* has an opinion also, hear it of course, but act upon it as he would and should upon yours when you are his patient. I do not say that you should not be helped to a judgment of the case from him, and I do not say that you should not learn even from his coachman, if either has anything to suggest, as they both very well may have. But recollect your position.

Consultations with surgeons and physicians upon cases under their or your treatment, are a different matter. They come to you for your observation and experience in those diseases which involve the teeth.

Here you are to be candid, guarded and unaffected. Be confident where you are clear, be sure where you can convince, be firm where you are satisfied. Do not consent to perform an operation which your own judgment absolutely condemns. A surgeon would not touch a limb with his knife if he believed it ought not to be amputated. Why should you act as the mere instrument of a surgeon's ignorance. Assert the equal rights of your own profession within your own sphere.

You have the conscience of a man, and the dignity of a profession to maintain. We wish our diploma to stand for what it claims in the conduct of your professional life. Dentistry is surgery, and if it were only stage driving it has a right to the track, and should "keep to the right as the law directs." In such consultations you give your opinion if it is asked, and you will carry it out in practice if required; or you will ingeniously and frankly modify such opinion for sufficient reason. You will also act as assistant, merely, in some great operation, just as a surgeon will perform an operation for an accoucheur, who lacks the skill without taking the responsibility of the entire case. But when the whole range and issue of the case is entirely within your province, the proper obligations and the independence of your science demands that you shall not sink your profession into a blind and discreditable submission. In all such consultations, whether the case is yours or the surgeon's, keep within your own department, even when your general medical and surgical knowledge is the superior of the two. It is dentistry that you are representing, dentistry only, with all which it includes, and it is but just, modest, and safe to keep within the line. Even success beyond your own borders of duty will be regarded as a sort of impertinence, as much so at least as the interference of the surgeon with your own proper department; and a failure is fatal to an intrusive audacity. The principle which lies at the bottom of this rule of conduct is, that all assumptions in callings not strictly your own, are of the nature of quackery, as much so in regard to other branches of the healing art, as in law, theology, or military science. You should know all the branches of general medicine, but you must

practice only your own, *its* respnsibilities you must take, and the necessity will justify or excuse even your mistakes there, but nothing warrants usurpation of other offices and duties. The best procedure is not to claim any thing beyond your proper range, and if you are, nevertheless, qualified, it will be perceived by the discerning among those whom you meet, and they will credit you with it, and with the delicacy besides, which duly respects their rights and honors.

Young practitioners are very apt to defer too much to persons of rank and pretension, in their chairs, and this may arise from feeling the importance of pleasing, and so securing their patronage. Even when modesty dictates this manner, it is an injurious weakness. When it is policy, it is, to say the least of it, a sad mistake. In justice to your sitter, you must not allow yourself to be swayed in the matters where you are the most competent to think and decide. And it is just as true that no man, however he may relish subserviency and flattery, wants such weakness in the man on whose knowledge and skill he feels his own dependence.

I can add but one suggestion now upon this theme, so ample, and so important that its thorough exposition deserves a treatise instead of a mere passing notice, and that is, be ever more intent upon your work, than upon your fame. Do your *duty* well, and that will take care of your reputation and your prosperity at the same time. You put your patient into the position of a mere subject of your art, whatever he may be, carry out the idea while he is in your hands by thinking of *yourself* only as the *operator* in the case. Your praise becomes any other man's mouth better than your own, and if *your* work becomes *their* mouths, their buccinators will blow your trumpet with deserved, acceptable, and genuine commendation.

Your *operating chair* should be so constructed that the patient shall fill it, that is, not so wide as to allow him to slide to the farther side of it, with an inconvenient distance between you. In such case you are obliged to twist and over-reach so as to fatigue yourself before half the day's work is done, and much disagreeable awkwardness of position, and many a bad

and imperpect touch and pressure results from it. But I mention this now especially for another purpose. The chair should permit the closest proximity of your person without the risk of accidental contact. A majority of our patients are ladies, and although they may submit, it is impossible to say how disagreeable personal contact may be to them. Disagreeable or otherwise, avoid it scrupulously. No matter what *your* feelings are, recollect that it is the most sensitive who are to give the rule. The finest ear, the most delicate smell, by right of superior fitness, prescribe the law in music and perfumery, and the duller and more indifferent sense is bound to except it from them. It is not every man who understands and feels, the sweet, chaste, sacredness of the person; and offences against it are everywhere but too common. In our profession more than in any other, discernment and delicacy are most invaluable and most obligatory. We are constantly occupied with our patients, in such way as to bring us into a sort of nearness which is easily overdone. Even the gentleness and soothing kindness of manner which we must often assume, readily passes into over-tenderness and familiarity. Our manner toward timid patients may become too caressing. When this over-sweetness and nearness is only a make-believe, it is contemptible to a lady of discernment, when it is a little more real it is simply an outrage: and let no man flatter himself that he is wholly secure from detection in any impropriety. Mere coarseness and bluntness of nerve is repugnant and offensive; indifference is insolent, and presumption is insulting. Nay, a mere doubt as to which or what it is, disturbs and distresses more than a lady's self-respect can well endure, though it will not acknowledge or intimate it. Here again the general rule comes in for our security when we have no more specific guide. Your patient is your subject, an impersonal object upon which you are employed as a work of art, and nothing else. Let me hint a particular or two for the general suggestions they afford. An accident disarranges her dress, and she will herself detect it, perhaps with a little mortification, so soon as she is relieved in her posture, or her nervous disturbance is quieted. Restore it if

you should for her relief, but do it with no feeling of impropriety, and with nothing of the manner which indicates such feeling. Dont subject her to the distress of discovering an exposure which she should avoid, nor rectify it as if it were an awkward affair.

Take another incident which may possibly happen. A piece of your gold, which you may need to use, slips from your forceps and falls upon some exposed part of her person, which ought not to be touched. If you *must* have that piece to finish your work, and injury would result by letting the mouth rest until you prepared more, then lift it, as you would from your own table, or any other *insensible* surface. Let the necessity justify the act, let the manner conform to that necessity, and there is no indelicacy in it, and none will be perceived or felt. Just *be* right and you will *do* right. Guard yourselves from accidents and their awkwardness by the highest rules, and unavoidable things will bring their excuses with them. One thing more, your patient however insensible or indifferent to decorum, is still only your patient. Treat no one in your chair with the soft nothings which do not become it. Carry the best habit of professional conduct into all your professional work, and you will have the benefit and happiness of it in many an unexpected way.

Believe me, gentlemen, I speak only from convictions of duty, credit me with no little opportunity for judging, and no slight impressions of the importance of these hints; and allow me to say also; that as the ten commandments, though they forbid lying and stealing, covetousness and murder, are no insult even to those who do not need such prohibitions, so the ideas of decency and duty which I submit, are in no proper sense an impeachment of any gentleman's taste, delicacy or integrity. They are things deserving to be known and considered, and therefore not improper to be uttered. I know my own motives, and you will not misjudge them.

Feeling the danger, rather of overlooking matters worthy of note, than of overloading the discussion with particulars, before I dismiss our special relations and conduct to our female pa-

tients, let me suggest another matter which ought to be considered: Ladies have their own motives, and perhaps feel some necessities which govern their intercourse with each other, that we neither know nor can understand. If the ladies of your own family must of necessity meet your patients in hall or parlor, it should be understood, that patients are not visiters, and that no necessary politenesses imply acquaintance and familiarity. They should be involved in nothing that they do not themselves contract for and distinctly invite.

In making your appointments, and receiving and dismissing them, have an eye to preventing all avoidable encounters of ladies who do not know each other or do not wish to meet, or to be met at your office; never *compel* any intercourse even between sisters which yon can avoid, you know nothing of the relations, the little troubles and embarrassments that may exist among them; make every one feel as safe as may be from anything and everything but that which she comes to you for, and rest assured that such consideration will pay—in just appreciation and in business prosperity. The simple right of the matter is, that every lady is entitled to her exclusiveness, for it may be of the highest moment to her feelings and her plans, and her dentist should not be a catastrophe to her.

Add to all this, that out of your office you have no business to recollect that she ever was in it, that she has a bad tooth in her head or that you made the handsomest ones she wears.

Now there is nothing in all this that she can or would ask you to observe, but not a point in it which you would not be censured for neglecting, and that, as far as you might avoid it, deservedly.

The Queen of Sheba, after a right royal confab with king Solomon, cried out in astonishment at the wisdom of the great professor of "proverbial philosophy," that "the half had not been told her." In quite another sense of these words that is your situation exactly, gentlemen, I mean that you have not heard the half that I have to say on this general subject, but whether your astonishment is like hers, or of a very different kind, it must be continued. I have more of the same sort in

preparation for you, and when we meet again, will proceed just as if both parties were equally well pleased with the entertainment.—*Dental Register.*

SECOND LECTURE.

Generalities of Professional Conduct—Order of the Office, &c.

We are not yet quite done with the office, its properties, and appointments. The attentions due to the ladies, very naturally led us a little aside from the main drift, as it would be laid down in a regular inventory of particulars, and we will now return to it for such observations as remain to be made, and I have time to present to you, first, some minor matters which I will not overlook, because I would not have you by any chance neglect them. The spittoon of the operating room should be as capable as possible of being always nice. It can be so constructed as to remove with the greatest celerity, all blood and other offensiveness from the sight of the patient, and relieve yourself from all disagreeableness of that kind which usually attends our operations. The patients, perhaps, feel more for such exposure in the presence of a gentlemanly operator than on their own account—do your best to relieve them in this matter.

The fewer instruments laid out for use the better. They should be returned to their respective places every night, I mean perfectly cleaned, and put into good order, taking them out with your own hands every morning, will enable you better to recollect through the day exactly what you have on your table, and you will be spared embarrassing searches for those which you will need. If you pass one by one through your hands before you begin your work, they will be at hand in every emergency. Besides, if they lie on the table from day to day, they will accumulate dust, fibres of cotton, and other small trash. Lying upon each other as they are dropped from the hand for irregularly long periods, they stain and defile

each other, and the fault is concealed till the moment that they are to be used, and besides, with such negligence and disarray, they get altogether an untidy look that is unbecoming and unpromising to the eyes of your patients. The same untidiness is evinced by a want or scarcity of clean towels and napkins. These should be abundant, and of the best and whitest linen, carefully washed and folded, and always at hand ready for instant use; my own stock reaches full forty dozens, and I would not be contented nor comfortable with a much smaller number. It is a common remark by our lady patients, that they would prefer such or such a dentist to operate for them, even if he had less reputation for skill, because his napkins are so clean, sweet and fresh, that they are sure it is a principle with him in everything. *This* qualification, any practitioner may easily command, whether in everything else he is quite superior or not, and as it atones for some want of skill, *have* at least that which it is inexcusable to want.

This brings me naturally to the person of the operator, under protest as before, that it is not your speaker, but the *subject* that is personal, with the application all afloat, till the proper person for himself appropriates it.

The dress of the dentist should always be clean, and of a kind that *looks* the character. That cleanliness should always be fresh too. The coat should be of a material that will wash, and of a color that would *show* dirt and not suspiciously conceal it. The *fact* with its best *evidence*, for the better assurance of the party concerned. The hair of our sitters is often greased; the arm necessarily rests upon the head, and the sleeve then contracts a soil and smell that is very often offensive to the face of the next patient. If you wear such a dress as will expose the fault, you will always see and correct it. A woollen sleeve is a regular sink for such unrecognized filth, and the *frowzy* smell and touch are sure to apprise the patient of the offence. His hair, if long and straight, should be so cut as not to fall like dipped candles over his own face or that of his sitter; and that part of his face which he shaves, should be cleanly shaved every day. His own mouth should be in per-

fect order, and at least as far as concerns the perfect purity of his breath, and generally it should look so well as to answer for a promising pattern card in his own face. "Physician heal thyself," has a direct application to him. If it hits him slap in the teeth as a reproach, it will go far to "condemn him out of his own mouth."

The attitude of the operator ought to be that of a man who stands up to his work as if it were fairly before him, not that of a man who has a tussle with it, or is engaged at something which he never did before, and therefore, knows not how to attack gracefully and with advantage. A surgeon who should thrust his right foot forward, to amputate a limb, with the knife in his right hand, would show such embarrassment or ignorance as would convict him of unpardonable awkwardness. His thigh would be in the way of his elbow, his elbow would hitch on the thigh, and his head would be all wrong to his body, and that would be cramped and strained out of all freedom and self-possession. Wherever there is much twisting, there is too much friction and too little liberty of action.

Many persons acquire a very bad and ugly habit of contorting the mouth and face, when they are doing difficult things. You will sometimes see it in persons writing, drawing, and playing upon musical instruments, but you never see it in the best performers in these several arts. It is a sign and confession of unskillfulness, as Hamlet says to the players, "I pray *you* avoid it." It is generally accompanied with a porpoise like breathing, snoring and blowing, from which the patient turns as soon as he can, while the unconscious operator imagines it is a gesture indicating pain, or a movement to relieve the fatigue of a constrained position. Train your eyes and face into propriety of behavior, and manage your chest, so that it shall not pant and wheeze like an asthmatic bellows; your face should be no more a tell-tale to betray your anxiety and exhaustion than that of an accomplished gambler, who stakes his last cent without betraying the danger and despair of the hazard. This fault is chiefly owing to the habit of breathing through the mouth and between the teeth instead of through the nostrils.

I care not how sweet and clear a man's mouth may be, it is an ugly habit to breathe through it upon the patient. And another very great fault, is to speak to your sitter with your face so close to his, that he must receive the current direct, and feel it, and bear it, without chance of escape, except by apprising you of its unpleasantness, which he can hardly do. Don't clean your nails with your knife in the presence of the patient, and don't *wash* your hands, or brush your teeth, there, either. Do this in your private room always, washing hands and cleaning nails, because they are dirty, don't satisfy anybody that they are clean, *there* is the dirty water to disprove it. *Lave* your hands in clean, pure water in his presence, that he may see it is *done*, as a lady pours hot water from an urn into a tea cup at the table for further assurance of the guests.

Among the habits which are offensive, are hawking, and then spitting to get rid of the phlegm—clearing the throat, nose blowing and the like, they need but to be named, and yet they do need to be named. I have only to say of them,

> "Oh, wad some power the giftie gie us
> To see ourselves as others see us,
> It wad frae mony a blunder free us."
> And ugly motion.

Here too, I may properly say to you, that all hurry, flutter, and bustle, under pressure of your engagements, are inconsistent with the best discharge of *present* duty. The case in hand is the *only* one that concerns the sitter, and in that *he* is too deeply concerned to accept a disturbed attention, or allow a distracting solicitude for the timely performance of other work. Let all your work be done with the properly assuring air of carefulness and attention. It is even fine practice in self-government to postpone anxieties until their time; make *them* keep their appointments also, it will be good for your patience, and it is due to your patients; manage your fretting, as well-bred women manage their crying or fainting, postpone it till you can do it up right.

An affected indifference, or a worrying slowness is as bad on the other hand. A natural earnestness, no more, no less, is the

proper air, and gives the suitable movement to the method of the skillful operator. It tranquilizes the patient, it secures his confidence, and gives you the government of his nerves, and of his opinions too; and this last is a large part of your stock in trade. Depend upon it, men pass, very much as bank notes do, for what they promise upon their face, and their genuineness is ascertained very much in the same way, that is by the style, expression, and excellence of the engraving. I do not speak of these things as mere mannerisms or tricks—*good* faith and good conscience forbid; but as of *true* symptoms of *true* things—"the outward and visible signs of inward and spiritual graces." They are eminently helpful in that self-culture which so much concerns you. There is a world of worthy wisdom in Hamlet's advice to his mother,—

> "Assume a virtue, if you have it not.
> That monster, Custom, is angel yet in this:
> That to the use of actions fair and good,
> He likewise gives a frock or livery,
> That aptly is put on: Refrain *but once,*
> And that shall lend a kind of easiness
> To the next abstinence; the next more easy,
> For use can almost change the stamp of nature,
> And either curb the devil, or throw him out,
> With wondrous potency."

Connected with this matter of manner and demeanor to your patients, is the proper management of interruptions of your work while they are in the chair, the unexpected things that turn up, which modify your plans of operation, and the length of time you detain them at a sitting. In all these things, let their convenience and advantage have their honest weight with you, and let them know and see it. Especially, never let your own profit govern you to their disadvantage, and let them think so. Frankness will secure the accommodation which you ought to ask, without grudging or complaint; and remember that you have no right to do anything hastily or idly, because you have a great deal of work, or a little of something else to do. Be really true and faithful, and you will be trusted, believed, and even indulged when occasion requires it. Treat your *gratis patients* especially well. Slights to them are insults as well as

injuries. Do your most generous things always in the most generous manner. A grudge will grow out of a favor very naturally, when it is really mixed up with it by yourself. Seeming indifference, and long postponement, are likely to be unkindly construed. Be careful, therefore, of the feelings of those who are not fully remunerating patients. If you tell a rich lady that you cannot attend to her for two, three, or more weeks; or if you have an appointment with her which you wish to break, she may scold you and feel disappointed, but she will not be hurt or offended, for she never suspects a slight; but less fortunate and less flattered people will think, "if I could recompense him fully, either in money or patronage, he would not have made me wait all these weeks." When you rain grace, come down handsomely like a spring shower; never drizzle, or your generosity will be *mist.*

The dismission of your patient often brings with it more or less talk, questioning and criticising the work that you have done. Don't be too much delighted with it yourself, nor too pressing in exacting praise from the patient. He may feel that his judgment is not very good, and that he has not had time to form it fairly, and he don't like to be committed for an approving opinion in advance of a thorough trial. He *may* suspect that there is some fault to be covered, and that his judgment is to be forestalled; and as to your own delight, besides the exaggerating conceit, which shows itself so plainly, there is a correct notion against you that superficial judges are the most liable to such raptures. A self-poised, thoroughbred man is not timid, doubtful or cautious, but he is moderate and collected, as well as firm in all the assurance he feels about his own performances, for he best knows how far from perfect the most skillful are. Just here, there is a strong temptation, also, to talk about the teeth of other patients, who may be known to your present company. Now, *if* their teeth are very good, and your work has been very successful for them, you may say so in general terms, when they are referred to; but be not too particular in description, for this will excite comparison, where there is perhaps no proper parallelism of conditions, and mis-

judgments will result. Indeed, if you fail of the same facility in description, or temper praise a little lower of some other case mentioned, your judgment will be so reported, and you will hear, before long, that you have not done equal justice to one or other of your patients.

All these mischiefs and indiscretions arise out of too much talk about your practice, which is the very thing you are least obliged to proclaim. The influence of the patient that you are now gossipping with, is all that you can gain by it, and that is best secured by the fine quality of your work in his or her case. Let her show *that*, and talk about it herself, and you will have your fame authenticated better than all bragging can do. A man need *not* put his light under a bushel; let it blaze on its own candlestick in his chamber; he will cut a sorry figure when he is caught carrying it out into the broad *sunlight* to show how it shines. The man that carries his own candle about with him will be conspicuous enough, indeed; but discerning people will think he would look rather better in any other light, and perhaps that he is, after all, only standing in his own light, in another sense than he imagines.

As to the matter of fees—which, if you have not yet thought of, it is to be presumed you *will*, some time or other in the course of your practice—I will take occasion, now, to say that I very well understand the importance of the subject, and, I believe, something of the philosophy of it besides. A few general suggestions only lie fairly in the track of this discourse, however, and they must be hastily presented. The amount chargeable for our operations is so controlled by the varying standards of place, custom, quality, and condition of patients, that arithmetic must be dispensed with in the discussion; the policy and principle of the thing only are within my present reach.

The first thing I have to say is, always make your work first-rate, whatever the price you may be obliged to accept for it. This will at last bring you a due appreciation, and then large fees will be sure to follow. Don't measure your skill too nicely by its reward; work for the *future*, if the present does not fully pay, and you will gather your bread from the waters when the *tide* rises, which it will be sure to do in its season. You never

can charge a liberal fee to *any* one, till he is assured of your deserving. To be *paid* for extra ability, you must have the reputation of it; work, then, in the beginning for the reward which an established reputation will bring you. It is a good investment. You never can charge by your *own* estimate of your work—it is upon your reputation that you build up your fees; lay that foundation broad and strong. It is a mistake in the laws of business for a man to say, "my best work is worth *more* than I charge for it, therefore I must bring the quality down to the price, for this is but justice to myself, and it is not unjust to others." In such a judgment, the insurance of a high reputation, the security of a warranting stamp, are quite overlooked. The public pays for the *thing*, and the *certainty* of its excellence, both. The latter, in matters of art, is a considerable part of its real price; you must have such a reputation before you can *charge* for it, and you must *earn* it before you *get* it. If you pursue the opposite course, you will never either *get a* character or *deserve* it. Sow good seed in the spring, and though it seems buried now, summer will bring it all up in the fullness of the harvest. You should, in fact, follow your profession for the love of it; the extras that you do on your own account, at first, will prove that this sentiment governs you. Some day your patients will hear an established dentist say, that such work as yours is worth more money than you have charged. He will hear such a man complain of so low a rate of fees, and then the work done in a generous devotion to your art, upon your own account, will be posted to your credit. Moreover, you want business, and abundance of it; for all reasons, reasonable rates at first will help you to this, and then the public will give you your choice of patients, and your own fair command of charges. It is the way of the world, and I do not say it is a wrong way. Little rills must run down hill, but freshets and high tides make nothing of running *up* hill. An old play puts this, pithily, and pointedly; old Mirabel, in the play of the Inconstant, asks his son whether he wants any money: "No, thank you, I have plenty," replies the artful young rogue. "Then here's some for you, my boy."

"To him that *hath* shall be given," is the rule. Manage, therefore, to have the kind of thing that you want, but by fair means, so that there shall be no awkward settlements afterwards, and your stock will grow rapidly. The effect of plenty of business results from the fact, that it signifies the confidence of a great many people, and proves your competency to those who have no other means of judging. But remember, through all just and honorable policies, that you are a member of an honorable profession, which you are to serve, and improve and honor. While your business increases, see that your quality of work improves, at least in an equal ratio. You are advancing in fees, your time pays better; all the rewards and honors of a steady and enlightened endeavor are accumulating; you can now receive the remuneration of your best skill, and, in all honor and honesty, you are bound to give it.

Up with your prices, and up with your work. You owe this to the fraternity, to your science, to a liberal public, that wants neither cheap talents nor gratuitous labor, and you can afford to maintain such high position while you deserve all its successes. One of the best things about high prices and a handsome practice is, that you get rid of uncomfortable people. My own experience is, that those who are disposed to huckster about the fees are hardest to please with the work; they have good reason to fear the same spirit which they feel, and they have no proper appreciation of anything liberal in your aims, or honorable in your conduct, for the lack of the same qualities in themselves. Work for a reputation that will put you out of their reach, and them out of your way. Above all, never forget that you are in debt to those who have achieved the discoveries in your profession, and improved its practice for your accomplishment. Regard the debt to our predecessors as an entailed one, and see that you pay it all over, with interest, to those who are to succeed you. Thus, gentlemen, fees, fidelity, and fame run together. May they all abound to you.

Treating, or intending to treat, a range of subjects, embracing the duties, decencies, and dignities of the practitioner and the man, in such amplitude of detail as I have indulged, you

will have noticed that I have steered clear, while I was sailing all round, the use and abuse of rum and tobacco.

I believe I have acquired some reputation as a rather rough rider of these hobbies, and I have, in fact, refrained from mounting them until I could change my dress, and trot them out by themselves. They are nags well known to be *strong-winded*, and hard in the *mouth*, and I think that a dentist ought to handle them with a specially stiff *bit*. They are an ugly pair of matches, illy broken, and worse trained, and demand so much of the jockey in their management, that it is very difficult to preserve the manner of a gentleman, through the discipline they require; and so I thought it was best to bring the brutes out by themselves, for I think they are unfit for any company but their own. The one, you know, is anything but sure-footed, and the other is addicted to a most vicious and villainous *use* of his teeth. In fact, the first is even liable to fits of the staggers; and the latter, between puffing, snuffing, and frothing at the mouth, is one of the most disagreeable of beasts. Neither of them was ever known to be clean, for nobody would touch either with anything but a whip, till they are completely broken.

My reason for not showing them up in their place and order in my discourse, is, because they are not fit for any place, and are themselves always in disorder. I do not know, from either reason or experience, in what vice, or necessity of the human constitution, the indulgence in these narcotics arises. But I *do* know, *both* by reason and experience, that they are unnecessary either to study, labor, or enjoyment; and, by the unblunted senses and sentiments of abstinence from their use, I know only too well how noxious and abominable they are. I do not here occupy the place of a lecturer upon the general evils of these various forms of intemperance, with a view to the social and moral reform of the community; but I am legitimately concerned with their offensiveness, their impropriety, and indecorum in the practitioners of our profession, and I ask you to hear the just complaint to which they are liable, and to consider your own duty in regard to them.

It is generally said that experience is the *best* teacher, but it

is nevertheless, just as true, that wrong-doers do not learn the right by it. It is an invariable law, that the practice of an evil is always accompanied by bondage to it; and whether it is a mercy or a curse to the sinner, he is always blind and insensible to his vice, in the proportion that he is enslaved.

It is a *straight* edge that detects the departures of a crooked one from the line; a habitually clean hand that feels the soil of dust, and a sober man who sees and understands the grossness of intoxication.

Rum drinkers and tobacco chewers must hear the truth about their habits from the abstemious, or they will never know it, and their incapacity for a correct judgment in the premises, of right obliges them to accept the opinion of those whose purity and sensibility qualifies them for giving true testimony. A smoker needs to be told that he smells offensively, even in an omnibus, with all the windows open; that the odor hangs upon his clothing for weeks after they are laid aside in his clothes-press; that even the new clothing sent home from the tailors, looking as fresh and pure as marriage garments, are often unendurable, from the segar-smoke that was worked into them on the journeyman's bench.

Fresh smoke of a fine segar in the open air may not be disagreeably scented to every nose; but the smoker himself is disgusted with the lees and dregs of the poisonous distilment which attach to the person and dress of those who have the habit. Extemporaneous washings and brushings in preparation for a visitor or a visit are next to nothing, they deceive nobody but the deceiver, for the foulness is in him, and over and around him, and it is not a lick and a promise, that will serve to hide it. I say it is in him, in his blood, and flesh, and breath, his skin and hair, beyond the reach of soap and water, too deep for gargles, and too strong for the counter-stench of cologne, bay rum or anything but assafetida. I am assured by a gentleman who subjected himself to a steam vapor bath, five days after he discontinued chewing, that the whole room was filled with the effluvia which the vapor boiled out of him. The attendant hurried him off to the cold shower bath, and threw up the windows

for his own relief. You know that the absorbents of the mouth, as well as the secreting vessels are at full play upon the quid, and you cannot doubt that the fluid extract will thence permeate the whole frame.

The fact that foreign substances enter the circulation in their formal state, and prove their presence in organs most distant from the gate they enter at, by the display of all their effects there, is too well proved to admit of question. If you take sulphur, it will color a silver watch in your pocket. Arsenic used for destroying the nerve of a tooth, must be carefully watched and guarded, for, if neglected, it will sometimes find its way from the cavity into the system, and work its mischief as certainly as if taken into the stomach. The garlic eaten by a cow, is strong upon her butter, new clover tastes her milk. Madder colors the *bones* of young animals fed upon it, and rhubarb taken by a nurse, can be detected in the alvine dejections of the child. If digestion, circulation, and all the sifting and straining that a substance encounters in its passage through the body, thus leaves it so little changed, especially in the case of aromatics, poisons and medicines, it is easy to believe, that every fibre and organ of the body may be penetrated by that substance which in its way is all these put together.

The same thing is true of all the kinds of stimulating liquor. Dr. John Hunter and his pupils affirm that they saw the blue flame, and detected the peculiar odor of burning alcohol in the brain of a drunkard, which they subjected to the experiment, for the purpose of ascertaining the fact of such absorption.

The professor of physiology, has, in the course of his lectures, probably had occasion to speak of the function of pulmonary transpiration. You are well informed, and well assured by other evidence which corroborates your scientific teachings, even by the authority of your own senses, that the lungs are among the principal emunctories of the system. Their service as excretory organs, is in fact not behind that of the skin and kidneys themselves. Scarce a scent or odor of any article of drink or diet, but is rendered back again by this route, which was before admitted through the mouth into the stomach.

The breath comes up as from a sink loaded with the pestilence, imbibed in gross indulgence. Who has not smelled the *double distilled* fumes of whiskey, all the worst for the *last* process, of ale, onions, oysters, garlick and tobacco upon the breath. What scavenger work these lungs of ours have to do! and sorry tell-tales they are too. They are vocal as well as respiratory organs you know, but their *loudest* utterings are nothing to the whispers, low but deep, which they give out, of our habits regular and irregular. Shakespeare, who misses nothing, has hit it finely, and deservedly placed it among the horrors that Cleopatra apprehended when she should be led captive through the streets of Rome.

> "Now Iras what thinkest thou?
> Thou, an Egyptian puppet, shall be shorne
> In Rome as well as I: Mechanic slaves
> With greasy aprons, tools and hammers, shall
> Uplift us to the view—In their *thick breaths,*
> *Rank* of gross diet, shall he be enclouded,
> And forced to drink their vapor."

I couldn't go wrong in such a matter by following my own nose, if it is proverbially a good guide in other things, it is quite infallible in this, and I am not without authority you see, the authority of our own books, of science, and that most wonderful of all directories, in thought and conduct, that richest treasury of truth, speculative and practical, that revelation of human nature, in all its heights and depths, the oracular Shakespeare. But if from these, there are any so hardy, or so obstinate as to take an appeal, the uncorrupted senses of every cleanly man shall be our umpire. Now please to figure your position at the operating chair. Your patient a delicately decent woman, with her mouth held open as wide as the lips permit, her nerves excited to their utmost keenness, and the operator hanging over her upturned face. A back tooth is to be seen and reached, a constrained position to be maintained by the operator, his face directly opposed, and as near as possible, and directly in the line of the open throat and nostrils, pumping at every stroke of his lungs the fetid breath of a rum sink or a tobacco mash, like a gasometer into her revolted senses!

I say it is hideous, I have no fitting words which it were fit to use in the description of the outrage.

As a question of conduct in professional practice, as a *condition* of success in *that* practice, the lightest word to be used about it is too heavy for one gentleman to throw directly at another. Therefore, again, I protest that I am not personal. Indeed, I am most happy to know, that while the medical colleges here and elsewhere, are infamous for these abuses; their lecture halls horrible with the stench of stale tobacco smoke, and the floors all covered with maps of the great lakes drawn in tobacco spit, rendering them tenfold more horrible than the dissecting rooms themselves in the warm dampness of the first days of March, our rooms are clear of the offence.

Many thanks, gentlemen, most sincerely and earnestly tendered to you for this among the many other pleasures I have found in our intercourse through this session.

I am convinced, and you will soon learn, that this matter has all the importance that I give it. I am fully convinced that it is not in caprice, or passion, pride or prejudice, nor is it in the compass of the English language to exaggerate the abominations which I am freely endeavoring to expose.

You will have perceived that in these two lectures devoted to professional conduct, and office economy and order, as in other instances of my prelections, I have had an eye, as occasion offered, to things which concern our profession, its honor, rank and general character, as well as to the strictly technical duties of my office. For my life I cannot sink the *man* and the profession, in the *trade*, nor even in the science which we pursue. Nor can you, without sinking the man, profession, trade and science, all together. Hence, as the Latin adage has it: "Hinc illæ lachrymæ," "hence these tears," and whatever of railing and railery has gone along with them. And while I cannot wholly over pass the reflex influence that the decorum and justice of professional conduct exert upon the man and the gentleman, I am not without the impulse, also, to say a timely word for the stand my brethren ought to take, and have so much power to make effectual toward the amelioration of the communities

in which they must hold a conspicuous position. The honors and confidence which the public gives us, will be cheapened sadly if we do not wear them usefully.

So far as beneficent reforms *rest* upon *reasons* that are to be found in our science, so far as they can be properly affected by our example, it is a debt of conscience to perform the social duty. We must not allow our own conduct to be construed against the truth of our own art. That from which the laws of health with which we are conversant should dissuade, must not have the *false warrant* of our *example.* That would be bearing false witness against our neighbor.

Ninety-six millions of gallons of ale and spirituous liquors were produced in the United States in 1852, and three hundred millions of barrels, or one hundred thousand tons of tobacco were grown in the same year—so says the census. If all this intoxicating liquor and more were consumed, and half the quantity of the weed, by our fellow citizens, which is a fair estimate; it is allowable in the well wishers of the race, to raise their voices against these monstrous evils, and ours ought not to be wanting, as citizens, philanthropists, and especially as guardians in our proper sphere of the public health. The report shows that the people of this country pay as much for imported cigars, as they receive for exported wheat, and drink in the form of French brandy the whole proceeds of the Indian corn exportation.

These high figures are truly astounding. I see not how we of all men, can look at them without concern—and may I not say to you in all confidence of their deserving your deepest consideration. "Think of these things," and as this phrase reminds me of its author, allow me to quote that fine summary of St. Paul to the Philippians, with which he concludes so many noble and excellent advices.

"Finally, brethren, whatsoever things are true, whatsoever things are venerable, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report, if there be *any* virtue, and if there be any praise—*Think of these things.*"

ARTICLE X.

Caries of the Teeth. By J. Taft, D. D. S.

The teeth occupy a prominent position in the animal organization; in regard to the human economy, this is especially true. The well-being of the entire organization depends much upon the perfect performance of the functions of the teeth.

The teeth of the inferior animals seem to have their whole design fulfilled in the acts of mastication and offensive and defensive operations. But in man the offices of the teeth are more numerous.

Mastication may be regarded as the primary and most important. This is the first step in the process of nutrition, and a failure here is not remedied elsewhere, it is here that the imperfect work of the teeth is transferred to other organs, to be by them accomplished, so far as they can, in addition to their legitimate work. Thus, that which should be thoroughly executed, is imperfectly done; other organs are over-taxed; and thus rendered inefficient for the proper performance of their appropriate work. These organs then, suffer from over work, and they with all the other organs from want of proper nourishment.

Man alone is endowed with the power of speech. The manifestation of this faculty is through a set of organs beautifully adapted to the purpose. All important among these we find a perfect well arranged set of teeth. He only who has a perfect set of teeth can control and modulate his voice, so as to exhibit language in its native beauty.

The teeth aid in giving expression and beauty to the countenance. They impart beauty and symmetry to the immediate vicinity, giving a fullness and boldness of outline, that never exists after their removal. In color they contrast admirably with the part about them. In the manifestation of the mind through the human countenance the teeth play an important part.

Notwithstanding the teeth are so important in the human economy, and though their functions are so various, and of such magnitude, they are neglected—they are subject to positive violence. Very few give the requisite attention to the teeth to preserve them from the injurious agents.

Owing to the artificial manner of living, the frequent impairment of health, this is often very difficult to do.

The teeth are subjected to positive violence in a variety of ways; crushing or biting hard substances, sustaining weights, violent percussion, sudden extremes of temperature, bungling dental operations, etc.

The dentine is effected by caries more frequently, than by any other form of disease. It is fatal in its tendency and of very frequent occurrence, scarcely any who have attained the age of maturity are free from its ravages.

It is a disease against which the resisting powers can make but a feeble stand; and one in which the recuperative powers can avail nothing. The opinion is maintained by some that softened dentine does in many cases regain its natural density. This cannot be, unless the softened part retains its vitality. Any agent possessing power sufficient to decompose the dentine will destroy its vitality. What is that decomposition? It is either a want of ability on the part of the vital power to maintain the integrity of the organic structure, or the action of some agent having an affinity for some part of the dentine, more potent than the maintaining vital force. In either case the vitality is destroyed. In an organized structure the removal of one of its component parts occasions the loss of vitality of the remaining part.

Caries makes its attack first upon the dentine and progresses most rapidly in the direction of the tubuli. There are variations from this, an example of which we have in the large superficial caries upon the labial surfaces of the superior incisors. It also in many cases progresses rapidly immediately beneath the enamel.

Portions of the dentine imperfectly protected by the enamel, either on account of its injured condition, or from imperfect

formation, are liable to be attacked by caries. Also points that by their location, or any unfavorable circumstance retain injurious agents in contact with the tooth, are very liable to decay.

The attack and progress of caries is modified by the constitution of the teeth.

They may be defective either originally or accidentally. Originally defective would extend to all the teeth of the same person. Accidental defection might exist only in some of the teeth in the same mouth, and these only at particular points. These conditions are peculiarly favorable for the attack of caries. When the whole crown of the tooth is imperfectly organized, decay will progress with uniform rapidity, under the influence of the agent producing it, till the entire crown is destroyed. When there are only portions of the tooth imperfectly organized they will be attacked by caries; after a time its progress becomes retarded, and in some cases checked altogether.

There are other circumstances that modify the progress of caries. A change of the condition or character of the agents producing it; the increased or diminished amount of such agents.

The progress of caries will also be goverend somewhat by the age of the person upon whose teeth it makes the attack. The teeth exhibit almost an infinite variety in regard to constitution. The relative proportion of their constituents is exceedingly various, even in persons of the same age. There is a continual change going on in the relative amount of the constituents of dentine as the person advances in age. The calcareous elements increasing and the annual decreasing. A proper relative amount of elements may be elaborated and yet a defective organization exist. This arises from an inability of the organizing power; or a want of arrangement and combination of the materials. The state of things is dependent entirely upon accidental causes. In vital energy, the teeth exhibit great diversity. This corresponds with, and is dependent upon, to some extent, the vital energy of the general constitution.

Dead dentine is decomposed more readily than the living, hence the conclusion that vitality resists caries; and the resistance corresponds with the vigor of that vitality.

The points most frequently attacked by caries, are the approximal surfaces of the teeth, the indentations and fissures upon the masticating surfaces of the molars and bicuspids, along, or at the termination of the longitudinal depressions upon the buccal and palatal walls of the molars, and at the necks of the teeth at the termination of the enamel. Upon the approximal surfaces of the teeth, the enamel is thinner than elsewhere; and the situation is one peculiarly favorable for the concentration and retention of injurious agents. The union of the enamel in the fissures and indentures of the crowns of the molars is frequently imperfect; and thus there is a way of entrance for vitiated fluids to the dentine. Decay is sooner exhibited at the termination or intersection of these fissures, than at any intermediate point.

The indentations or grooves upon the sides of the teeth are usually attacked by caries at that point next to the neck of the teeth. Caries, less frequent than in the above cases is exhibited at the necks of the teeth just beneath the border of the enamel; here it burrows under the enamel, though its transverse extension is greatest. The order in which the elements are removed is governed by the nature of the agent producing the decomposition. Usually the decomposition is produced by some agent having an affinity for the calcareous elements sufficiently strong to destroy the texture of the dentine and remove the earthy portion. The acids having an affinity for the lime of the dentine produces its decomposition in this manner. When the decay is thus produced, the portion remaining in the cavity is soft, and approximates the gelatinous condition, correspondent to the amount of calcareous material removed. In this kind of decay we find it soft and tenacious. Agents of a different character from those referred to, often produce decay. Alkalies will act upon the animal portion of the dentine, and remove it. In caries thus produced the residue is friable and chalk-like. In other cases the constituents are removed simultaneously. Nitric acid will produce the entire breaking up of both the earthy and animal constituents.

Death of the dentine generally produces decay. It is more

easily decomposed after the vitality is destroyed. There are apparent exceptions to this. The dentine beyond the decay may be in an inflamed and irritable condition, so that contact with the decayed part will produce pain; in this way we may be lead to conclude that the softened dentine is sensitive, when such is not the case. It is maintained that there are cases in which the partially decomposed dentine is sensitive, supposing that a small portion of the calcareous elements may be removed, and yet the filiments of the nerve ramifying the part not to be destroyed.

The progress of caries is far more rapid in the crowns of the teeth than in the roots. The crowns are more exposed to the influences of external injuries. It is true that the crowns are covered by enamel designed to shield the dentine from injury, but it is often defective, and agents are concentrated upon it that it cannot resist, even when it is perfect, so that the enamel itself is sometimes decomposed. The roots possess a higher degree of vitality than the crowns, and the resistance to the encroachments of decay is correspondingly greater, hence we often find roots free from decay and solid, the crowns of which have been removed by rapid decay.

Injurious substances are sometimes pressed into contact with the dentine through defective points of the enamel, or under its projections, and thus retained till its mischievous action is accomplished.

It is maintained by some writers that caries is contagious. Dr. Koecker was of this opinion. The question arises here, is there any property in the decayed dentine capable of producing the same condition in the healthy dentine of another tooth?

The residue of decayed dentine is, in the soft decay, the animal elements, with a slight portion of earthy material; and in decay, in which the gelatinous portion is removed, the remainder is chalk-like, consisting mainly, of phosphate of lime. In neither of these is there anything that can possibly operate on the healthy dentine. There is one thing here worthy of consideration, and which has probably led to the mistaken notion that caries is contagious. The decayed dentine will absorb and

retain fluids that will act on the sound dentine. And when the decay is on the approximal portion of the tooth, two teeth are subject to the exciting cause, so that, so far as the chemical action of the agent is concerned, the two teeth are alike subject to its operation.

It is but seldom that two teeth thus situated are both in the same stage of decay. This arises, principally, from the difference in their constitution.

The decay of the teeth, in pairs, has also been attributed to the contagious character of the disease. This, however, results from the fact, that the pairs of teeth are formed at the same time; and are subject to the same influences in their formation, and hence are constituted alike; and if one is defective the other will be in a similar condition. When there is a vitiation of the saliva, or mucus, they will be similarly affected. In no common acceptation of the term contagious, can it be applied to caries of the teeth. The color of caries is exceedingly various. It is found in color the same as the healthy dentine, and presenting every intermediate shade, from that to a jet black. The rapidity of decay may be determined by its color; it progresses less rapidly as the color becomes darker, so that, when the decay is almost stationary, the affected portion is black. The shades of color are differently marked by different writers. Koecker enumerates five, others seven, and so on. Three are sufficient for our purpose—*white*, *brown* and *black*. The sensitiveness of the dentine is greatest in teeth affected with the light colored decay. The sensitiveness usually decreases as the color increases. There are exceptions to this. We occasionally find teeth, the decay of which is dark, and yet quite sensitive. The light colored decay is more difficult to arrest than the dark. Dark, or black, decay is easily arrested, while the white is arrested with much difficulty. Filling, in many cases of this kind, seems scarcely to retard the progress of the decay; while in the brown, or black, decay, by proper filling, the progress of the decay is checked altogether. The cause of the dark color of caries is not perfectly comprehended. It is doubtless a deposit upon the decayed part, and it is most

probably a metallic oxyd. In the saliva and mucus are found *iron*, *sodium*, *potassium*, and *calcium*, in several combinations.

The opinion is entertained by some, that this deposit protects the dentine from the influence of injurious agents. This is most probably not the case, at least to any perceivable extent. If this does serve as a protection, the removal of the discolored portion would subject the dentine to a renewed attack of caries, which experience assures us it does not do, but after some considerable time it assumes the dark hue again.

Those who maintain that the dentine is protected by the deposit, refer to the fact, that a deposit of oxyd of silver may be made upon decay of a light color, by the use of nit. arg., and that after such deposit is made, the progress of the decay is retarded. This, however, is more probably occasioned by a change in the character of the decay, and not because it is protected by the coating of oxyd of silver.

There is commonly some sensibility resulting from caries of the teeth. It does not often amount to pain, but is rather a sense of uneasiness; yet when anything is brought into contact with the sensitive dentine, as sudden changes of temperature, acids, &c., intense pain may be produced.

Dr. Koecker remarks, that caries is more tender in its first stages. Dr. Cone remarks, that when a tooth is attacked by caries, sensibility is increased. The surface of the dentine, or that part united to the enamel, is susceptible of the highest sensibility. At the point of union of the dentine with the enamel, is the termination of the nerve fibrils that pervade the dentine. These terminations possess a greater sensibility, both in a healthy and diseased state, than along the body of the fibrils. When there is inflammation of dentine, intense pain may be produced by the contact of an instrument, in a cavity of decay, at the line of union of the dentine with the enamel, and very little sensibility manifested elsewhere in the cavity. Sensibility of a uniform character sometimes pervades all parts of the cavity; at other times it may be very intense at one point, and very slight or not exist at all at any other point in the cavity. A thin lamina of the dentine lining the entire

cavity, may be uniformly sensitive, and in some cases the sensibility will involve the entire body of the dentine.

By means of the sensibility, warning is transmitted to the pulp, and it throws out osseous material with increased energy, and thus a process of filling up the natural cavity of the tooth is established, that the decay may not encroach upon the nerve. This warning may be transmitted to the pulp to some extent, though there be no increase of sensibility.

The sensibility is modified by the character of the teeth, and the nature of the decay, and the state of the constitution of the patient. The teeth of the same person will be more sensitive at one time than at another, owing to the irritability of the nervous system. Those teeth that decay most rapidly, are usually most sensitive. There are some teeth in which the vitality is destroyed considerably in advance of the decay; and in such cases there is no sensibility at all. Except in such cases as last mentioned, the most rapid and whitest decay is most sensitive. There is much less sensibility in the brown, and scarcely any in the black decay.

Sensibility exists in all degrees, from the mildest to the most intense. It is very various in the teeth of the same person, at the same period; owing to their different susceptibility, and the difference in exposure to irritating agents. It is more common and more severe in young persons.—*Dental Register.*

ARTICLE XI.

Treatment of Dental Caries when Complicated with an Irritable or Exposed Pulp. By JAMES TAYLOR.

PERHAPS there is no department of surgical or medical science, which is demanding more attention at this time than that which heads this article.

We do not believe that in all the range of medical science, any one disease is receiving more careful study and enlisting

more talent than this. Master minds and skillful surgeons are testing the utmost powers of our art to wrest from disease, organs heretofore considered hopelessly lost, however great may be the achievements of mechanical dentistry, and important the improvements here made, yet they cannot surpass the progress which is evidently being made in this particular department of dental science. The object of one is merely to repair the loss made by disease: the other to prevent that loss, and just so far as the natural organs are superior to artificial ones, is this subject paramount in importance to the other.

The skillful dentist who has kept pace with the improvements of the profession must feel some gratification in view of the fact; that, while many are disposed to sacrifice the *troublesome natural* organs so as to give place to the beautiful artificial, yet there are many equally disposed to combat the ravages of disease and restore these troublesome members to beauty and usefulness. Just how far the conscientious dentist may sacrifice utility to beauty is a matter which must be decided by the circumstances of the case, yet we think some consciences need education in this affair as well as other things.

A very interesting presentation of the subject we have chosen for this article would be to present the views of the profession on the treatment of exposed pulp, as now advocated, and ten to fifteen years since. This could be done by reference to articles then and now published—the contrast would likely be greater than most are aware of.

But we design not taking this view of the subject, but shall as we think, present a few practical thoughts on the anatomical and pathological relations which exist between the teeth themselves and the surrounding tissues which are more or less affected by the disease under consideration. As it regards the treatment, the entire subject will necessarily embrace—first, the symptoms and treatment of an irritable pulp before an utter exposure by decay—second, the symptoms and treatment of an exposed pulp with an object to its preservation, and third, the different means of destroying the pulp, and the practicability of preserving the tooth after this source of internal vitality has been removed.

Anatomically and pathologically studied, the teeth with their surrounding investments would seem to point out a beneficent structural organization and adaptation, whereby science might expect to meet and remedy many of the evil consequences of disease. We take it for granted here, and believe that the tooth is the best possible organization which a beneficent Creator could devise to subserve the purpose for which they are designed. Infinite Wisdom has certainly been displayed in their structure—how important the enamel, how skillfully and admirably its columns are arranged for strength and use. Where is the organization which could take its place, and alike resist the action of foreign substance which must necessarily be daily brought in contact with it? In elements it more nearly harmonizes with the dentine which it covers than any other substances which possesses its density and durability. The dentine, how very nearly it approaches the bones of the body, and yet for adaptation to the flint-like structure of the enamel how much more hard and firm is its structure, and of what use would be the enamel with a less solid base to rest upon? But how shall so dense a structure be adapted and made to harmonize with its more soft connections. To meet this condition of things, commencing at the edge of the gum or enamel and thickening to the apex of the fang is a covering of crusta petrosa or cementum, through which it is prepared for its connection with the periosteum, could anything be more admirably arranged? Well we would say, that this is mechanically most wisely constructed. Let us see if it is not anatomically so too. In the osseous structure the density is not such as to prevent an amount of circulation sufficient for its reproduction and maintaining of its vital connection with the soft part. But this would be insufficient for the organs of mastication, for a greater degree of strength and solidity is necessary for those organs which must first lay hold of, and prepare the food for the purposes of the animal economy. This very condition of things forbid a like circulation as is maintained through the bones of the body, but to meet this condition of things and maintain a vital connection, which shall subserve the requirements of the economy, we have first the usual perios-

tial covering which attaches itself to the cementum—supplying it with a circulation and vitality, but which so feebly transmits its vital fluid through the dentine that it may be entirely suspended in this, without disarranging that maintained with the cementum. In this arrangement we see the wise provision which is made for an injury, accidental or from disease, which foresight must have anticipated for organs so much exposed.

The sources of internal vitality penetrate the tooth through the apex of the fang, and after having elaborated the organ, appear content to sustain through its dentinal portion, a sufficient degree of vitality to subserve the purposes of a living organization, and feebly protect itself in its bony canal from the encroachment of disease. This power of self-preservation is an important one, and we are satisfied when judiciously attended to in deep seated caries, many teeth can be easily saved as living organs, which are now, if saved at all, saved as dead ones.

The pulp appears designed to maintain the vitality of the dentine, and in this, sends through its tubular or cellular structure a coloring fluid which marks it as a living body. Every practitioner is soon enabled to tell by the hue of the organ whether the pulp is diseased or not. It is not fair to infer that the suspension of this circulation and the change which it undergoes, when retained in the tubuli, is the cause of the darkened hue which the teeth assume on the death of the pulp. Does the death of the pulp necessarily give us a dead organ throughout its entire structure? This is an important question, and on its proper solution, we should be governed in the treatment of these organs. If the death of the pulp only involves the loss of the vitality of the dentine, we may with propriety try to arrest the further progress of the disease. If, however, it involves loss of vitality in the cementum, the question arises: Will the periosteum maintain its connection with the dead osseous structure? What evidence have we that the alveolo-dental membrane supplies nourishment and vitality to the cementum, and does it ever do more than this? Does it, under favorable circumstances connect itself with the pulp organ through the dentine? To sustain the latter, we have the reported case

of Prof. Mussey alluded to some year or two since in the Register, in which, on the removal of an inferior incisor, the labial portion of which, and also the point of the fang was laid bare by an absorption of the gum and alveolus, and yet the pulp was alive. The nerve and blood vessels which pass in and out at the apex of the root, had been severed by the disease for sometime, still, blood and a living nerve was found in its narrow canal. During the summer, having occasion to remove two such teeth for a patient, we split both for an examination, and found in one a living nerve and blood vessels apparently perfect.* It may also be remarked that nerves often remain living in teeth long after the crown is destroyed by disease. Still the question would be pertinent; are they kept so without any aid from the periosteum? It appears to us that the anatomical arrangement of the tooth with the enamel, dentine, cementum and periosteum, the first possessing little if any vitality, the second with increased sensibility, and the third, still increased in this particular, whilst the last, the periosteum has its usual amount of vital powers as displayed in other parts of the body, is specially arranged to provide for exigencies that may arise as the result of disease in organs so important. The vitality so gradually diminishes as we approach the enamel that no great disturbance to the vital functions takes place, if it is even cut short before it reaches this outer covering. For instance, the cementum may still maintain its healthy functions if the dentine be impaired. The dentine receiving its principal supply of vitality from the internal vessels, these may be removed and the tooth as connected with its alveolar investments, still be regarded as a living organ. We regard the cementum as an intermediary substance between the periosteum and dentine, and so peculiarly organized that the contact of the latter even in a dead state does not necessarily impair its proper function.

But if we take the position which the two cases of living pulps already referred to would warrant, we would suppose that

*We hope the profession will not let cases of a like character pass without an examination.

the periosteal vessels which supply the cementum penetrate also the dentine, and for a long time maintain a low degree of vitality in this. This, it is true, is a supposition, but let us see if the inference is not a fair one.

We are first met with the fact, that roots of teeth when their crowns have been removed, generally in a few years show signs of being regarded by the contiguous parts as foreign bodies. This although a general rule, is not universally so. There are numerous exceptions to this, and they often maintain their integrity so long that the cause demands investigation. Is it a peculiar idiosyncrasy of the system which adapts itself to this condition of things, or is it because the circumstances following the result of the disease which has occasioned the loss of the crown, have been such as would ordinarily result in a like preservation? We admit there are certain favorable, and also unfavorable conditions of the system—such as constitutional organization, etc., which would tend to a favorable or unfavorable issue as regards the preservation of healthy action, yet we feel as sure that there are certain circumstances generally involved in the loss of the crowns of the teeth by disease that are sufficient in and of themselves, to cause the surrounding parts to repel the roots as irritants. We must not forget that perfectly sound and healthy teeth even when invested in healthy alveolar processes and gums, when they have lost their antagonists, also soon show evidences of being regarded by the contiguous parts as no longer useful but unnecessary and foreign. Roots of teeth are relatively in the same condition, they have lost their antagonism. Roots of teeth to which artificial crowns have been attached sometimes last for twenty years, and why, because the antagonism is restored and we might add the dead and decomposed portions have been removed.

But we seek further cause why teeth often become irritants and act as foreign bodies, and we think we shall find it; not in the fact that the dentinal portion of the tooth has lost its vital principle from the death of the pulp, and hence acts as an irritant on the periosteum through the cementum; but the death of the pulp has made an impression on the periosteum at the

apex of the fang where the pulp vessels pass through this membrane as they enter the teeth, and here begins that disease which so often separates the teeth from the surrounding parts, and this disease acts upon the membrane itself. We might adduce as evidence of this, the fact that the disease which manifests itself in repelling the roots, generally commences at the apex of the fang. The irritation is here first set up and the periosteum often is separated at this point, while around the main body of the root it maintains its integrity. We regard the decomposed pulp which is often left in the canal at the end of the root as a continued source of irritation to the periosteum, also all foreign matter subject to decomposition which may be forced from various causes into the nerve cavity. But we are anticipating our subject, for when we come to speak of the destruction of the pulp, and preservation of the teeth, we shall have occasion to elucidate this subject more fully. Having alluded somewhat freely to that anatomical organization of the teeth which is necessary to a proper understanding of the pathological changes which are developed in the progress of disease, we shall now consider the nature and treatment of deep seated caries resulting in irritation of the dental pulp before exposure.

Different authors describe a great many different varieties of this disease, more indeed than is necessary to a proper understanding thereof, a consideration at this time of the varied characteristics which the disease assumes would only cause confusion where we wish simplicity. For the sake of brevity and simplicity, we merely classify into three varieties, considering all others as mere modifications of these. The peculiar characteristics which accompany these forms of the disease should be understood and carefully observed in the treatment of deep seated caries. We use the words "deep seated caries," merely to express a condition of decay, and not a distinct form of disease. The disease must be deep seated when it has nearly reached the pulp. We classify as follows, first black caries, second brown, and then white. These forms of disease we regard as incidental to peculiar constitutional organization, habits of the individual, and proximate cause of disease.

A few words in relation to the particular character of these varieties of caries will be necessary to diagnose a proper treatment.

The black caries is what the name indicates. It is generally slow in its progress, rather hard of texture and possesses less sensibility than either of the others, there appears to be at no time, little if any inflammation of the dentine. The agent inducing the disease appears to act very feebly, scarcely possessing the power to disintegrate the constituents of the dentine; very often the agent having exhausted its powers, the disease becomes stationary. In this form of disease we but seldom find the pulp exposed. The irritation which it induces is ordinarily not more than sufficient to establish a deposition of bony matter by the pulp organ which it often does as rapidly as the disease advances—thus keeping up the relative distance between itself and its approaching enemy.

These are facts which should be borne in mind in our diagnosis of the proximity of the pulp, also the vis medicatrix naturæ to be relied on in arresting the disease.

The brown variety of caries progresses far more rapidly than the black, and just as far as it assimilates the latter, is its sensibility and progress diminished. In this form of the disease there is generally much sensibility of the dentine and often positive inflammation, layer after layer of the dentine is decomposed, the earthy portion being completely disintegrated, leaving the cartilaginous structure soft and flexible, very soon the disease becomes deep seated, either exposing the pulp or leaving a mere lamina of the dentine covering this organ in an inflamed condition, this lamina of the dentine being important as a covering to the pulp it is necessary if possible to restore it to health and preserve.

The white variety of caries is characterized by great sensibility, the rapidity of its progress and the removal of more of the cartilaginous structure than in the brown variety, sometimes the lamina of dentine under the disease is hard and dense and very sensitive, and then again less sensitive but penetrating deep and soon exposing the pulp. These particular forms of disease

are, it is true, often much modified by the general constitutional health and the vitiated secretions of the mouth.—*Dent. Reg.*

(To be continued.)

ARTICLE XII.

Chlorine. (CL=35. 42.) By G. WATT, D. D. S., M. D., Xenia, Ohio.

CHLORINE, under ordinary circumstances, is a greenish yellow gas. Its name is derived from the Greek word which expresses its color. When reduced, by pressure, to one-fifth its ordinary volume, it becomes a liquid, whose density is 1.33. It has not yet been congealed. The density of the gas is 2.44, hence it is $2\frac{1}{2}$ times as heavy as air.

Chlorine was discovered in 1774, by Scheele, who called it "*dephlogisticated marine acid,*" and was supposed to consist of muriatic acid and oxygen. About 1809 or 1810, it was classed by Davy, with the simple bodies, and this position is now universally assigned it by chemists. Chlorine is usually obtained by the action of hydro-chloric acid on binoxyd of manganese.

Equal parts of the two ingredients may be put into a retort and heat applied. The gas may be collected from the discharging tube, over warm water; but it is better to collect it, in dry bottles, by displacement of air. The reaction which takes place is as follows:

2 eq. Hydchl. acid,	1 eq. Cl. - - -		Is set free,
	1 eq. Cl. - - -		1 eq. M. Cl.
	2 eq. H.	2 eq. water.	
1 eq. Binox. Manganese	2 eq. ex.		
	1 Mangan - 1 eq.		

The affinities which determine these changes, are the mutual attractions of oxygen and hydrogen, and of chlorine and manganese.

Distilled or recently boiled water dissolves twice its volume of chlorine, and yields it again when heated. This solubility renders it impracticable to preserve it over water, and its affinity for mercury prevents its being collected over that metal.

Chlorine has an astringent taste and a disagreeable odor. It is one of the most suffocating gases, causing spasm of the glottis and great irritation, even when considerably diluted. Light produces no effect upon it when dry, but if water be present, its hydrogen combines with the chlorine, forming hydrochloric acid. Hence the necessity of keeping solutions of chlorine in the dark is manifest.

Chlorine has powerful affinities. It unites energetically with hydrogen, and on this property depend many of the chemical phenomena to which it gives rise. An explosion always takes place when a lighted taper is plunged into a mixture of these two gases. It acts powerfully on the metals, readily converting them entirely into chlorides. Most of them combine with it even in the cold, and so energetic is the combination with many, that the temperature rises to ignition. Many substances take fire when thrown in a finely powdered state into a bottle filled with chlorine, and hence it may be called a supporter of combustion.

Chlorine is, indirectly, a most powerful oxydizing agent. Thus, when chlorine and a body which has a strong affinity for oxygen are brought in contact, water is usually resolved into its elements, its hydrogen uniting with the chlorine, and its oxygen with the other body.

When a compound of chlorine and an inflammable substance is exposed to a galvanic current, the inflammable body goes to the —, and the chlorine to the + pole. A close analogy is thus established between oxygen and chlorine, both are negative electrics, and both supporters of combustion.

Chlorine is extensively used in the arts for bleaching linen and cotton fabrics, and, in general, for destroying animal and

vegetable colors. These coloring matters, like all other organic substances, are composed of carbon, hydrogen, oxygen, and sometimes of nitrogen. Chlorine generally decomposes them by appropriating their hydrogen, to form hydrochloric acid. In some cases, however, it seems that there is no bleaching, in the absence of moisture. It is probable then, that the oxygen, liberated by the decomposition of the water, is the bleaching agent.

Chlorine is extensively used for fumigation. For destroying miasmatic, noxious effluvia, and putrid odors, it is the best agent known. It acts as a poison on the animal system, both when inhaled and when swallowed. It should, therefore, be handled with due caution.

The compounds of chlorine, which are not acid, are called chlorides. Some of its combinations are interesting and important to the dentist. A few only will be noticed at present, and these without much regard to system.

Hydrochloric Acid, (HCl.=36.42.)

A concentration of this acid, is the *muriatic*, *chlorohydric*, or *hydrochloric* acid of commerce. In its purer form of gas, it was discovered by Priestly, in 1772. It is conveniently obtained by putting a portion of the hydrochloric acid of commerce in a glass flask, and heating it till the liquid boils, when the gas is freely evolved, and may be collected over mercury. It cannot be collected over water. It is also prepared by the action of concentrated sulphuric acid on common salt. The gas is freely disengaged by the application of heat. In the former case, the hydrochloric acid, previously dissolved in the water, is simply expelled from it by heat. The reaction in the latter case is represented by the following equation: Na. Cl. +SO3, HO=Na.O+HCL; or it may, perhaps, be better understood by the following diagram:

Chloride of sodium { Chlorine, } Hydrochlor acid.
Chloride of sodium { Sodium } Soda
Sulph. acid of commerce. { water { oxygen } Soda
Sulph. acid of commerce. { water { Hydrogen } Hydrochlor acid.
Soda } Sulph. of Soda.
Sulph. acid of commerce. { Sulph. acid . . . . } Sulph. of Soda.

Hydrochloric acid may be generated by the direct combination of its elements; a mixture of equal volumes of the two gases unite by explosion on the introduction of flame, a red hot body, spongy platinum, or by the passage of an electric spark. Even in diffused light they combine, but without explosion.

Hydrochloric acid is colorless, gives off copious fumes, which are formed by the acid uniting with the water of the atmosphere. It has a pungent odor and an acid taste, is irrespirable, exciting violent spasm of the glottis, extinguishes burning bodies, and is not inflammable.

It is not chemically changed by heat, but is readily decomposed by galvanism, hydrogen appearing at the —, and chlorine at the + pole. A striking property of the gas is its attraction for water, which, at 32° absorbs more than 500 times its volume of it. Ice is instantly liquified by it. The density of the liquid acid concentrated in the cold, is 1.21.

The hydrochloric acid of commerce is seldom pure, generally showing a yellowish tinge, caused by the presence of iron, and it frequently contains a small quantity of sulphurous acid. It is readily purified by distillation. The sulphurous acid may be converted into the sulphuric, by passing a few bubbles of chlorine through the solutions, and the sulphuric is precipitated, as sulphate of baryta, by chloride of barium.

A solution of the pure acid is perfectly colorless. In cases of poisoning by hydrochloric acid, the antidotes are chalk, whiting, magnesia, soap, &c.

Compounds of Chlorine and Oxygen.—Both chlorine and oxygen manifest an energetic attraction for most elementary substances, yet they have but a slight affinity for each other, they are consequently not found in nature, in a state of combination. They cannot be made to combine directly, and when united, very slight causes separate them.

They form several combinations, five of which are well ascertained, and are possessed of acid properties. These are:—

1. Hydrochlorous acid, ClO.
2. Chlorous acid, ClO3.

3. Hypochloric acid, $ClO4$.
4. Chloric acid, $ClO5$.
5. Perchloric acid, $ClO7$.

Of these, we will notice at present, only.

Chloric Acid, ($ClO5.=75.42.$)

When a strong solution of potassa is saturated with chlorine, white crystals of chlorate of potassa are separated after standing, while a large quantity of chloride of potassium, and a small quantity of chlorate of potassa, remain in solution. The reaction which takes place is as follows:

$$Cl.+6KO=5\ KCl.+KO,\ ClO5.$$

To purify the chlorate, dissolve it in boiling water—the greater part of it will be deposited in crystals, as the liquid cools.

All the compounds of chlorine and oxygen are prepared from the chlorate of potassa. Chloric acid is prepared by adding to a solution of chlorate of potassa, hydro-fluosilicic acid. The gelatinous silico-fluoride of potassium is precipitated, and chloric acid remains in solution. But as the silico-fluoride is a transparent precipitate, it is difficult to know when the potassium is entirely precipitated, and the hydro-fluosilicic acid, is therefore likely to be used in excess, hence the liquid, containing hydro-fluosilicic, and chloric acids should be filtered, and saturated with a solution of baryta, which forms an insoluble hydro-fluosilicate with the one, and a soluble chlorate with the other. The liquid is again filtered and evaporated, and the chlorate of baryta is obtained in crystals. The chloric acid may then be separated by dissolving the chlorate in water, and adding sulphuric acid, as long as a precipitate is formed. The sulphate of baryta may be separated on a filter, and the liquid which contains only chloric acid, may be evaporated to the proper consistence, under the receiver of an air pump.

Chloric acid is already decomposed by heat, or by the presence of de-oxydizing agents. At a little above 100°, it is converted into perchloric acid, ($ClO7$,) and chlorous acid, ($ClO3$.) At a still higher temperature it is resolved into its elements. Sulphuric acid deprives it of oxygen, with the formation of sulphuric acid and the evolution of chlorine.

By mixing chloric with hydrochloric acid, chlorine is copiously liberated, as may be illustrated by the following equation:

$$5HCl + ClO5 = 5HO + 6Cl.$$

This mixture is an admirable solvent for gold, platinum, &c., but the inconvenience of preparing, and the difficulty of preserving the chloric acid, renders its use impracticable, in most cases.

Aqua Regia.—Chlorine is also freely disengaged from a mixture of nitric and hydrochloric acids. This well known mixture was called by the alchemists, aqua regia, (royal water,) from its power to dissolve gold, which they regarded as the *king* of metals. It may be made by mixing one volume of nitric, with 2, 3, or 4 volumes of hydrochloric acid.

When aqua regia acts on any metal, the following reaction takes place between the two acids of which it is composed:

$$NO\,5 + 2\,HCl = NO3 + 2\,H\,O + 2\,Cl.$$

A metal placed in this liquid, therefore, meets chlorine in its nacent state, and is, in consequence, rapidly dissolved in the state of chloride.

The metallic chlorides might be considered with more propriety, perhaps, under the various metals, but as this is an isolated article, we will notice a few of them here.

Chloride of Sodium. (Na. Cl. = 58.7.)

This well known table salt, may be formed directly, by heating sodium in hydrochloric acid gas, by burning the metal in chlorine, or by neutralizing soda with hydrochloric acid. It is the chief saline ingredient of sea-water, and exists as a mineral under the name of rock-salt, and it is contained in many saline springs. Obtained from any of these sources it contains traces of sulphate of magnesia and lime and chloride of magnesium. These may be precipitated as carbonates by boiling a solution of the salt with an excess of carbonate of soda, then by filtering the liquid, and neutralizing with hydrochloric acid, pure chloride of sodium is obtained.

When a solution of chloride of sodium evaporates spontaneously, the crystals are regular cubes, but when the process is rapidly conducted they are hollow four-sided pyramids, formed

by the adhesion of minute cubes. They contain no water of crystalization.

This salt is also found in the organized kingdom, as in saline plants, and in the blood, saliva, urine, etc., of man, and many of the lower animals.

Its general use is well known. The dentist uses it in the laboratory to precipitate silver, as a chloride, and some use it as a dentifrice—a practice of at least doubtful utility.

Chloride of Zinc. (Zn. Cl.=67.72.)

When minutely divided zinc is introduced into chlorine gas, they combine with the evolution of heat and light, and this salt is formed. It is readily and cheaply prepared by dissolving the metal, or its oxyd, in hydrochloric acid, evaporating to dryness, and fusing the residue in a narrow necked glass vessel.

Chloride of zinc is a grayish-white, soft, semi-transparent mass. It is soluble in water, alcohol and ether. It fuses a little above 212°, and sublimes at a red heat. It is highly deliquescent.

Its local action on living tissue is that of an escharotic. This action depends principally on its affinity for albumen and gelatine. As a caustic it is exceedingly active, decomposing the organic tissues as rapidly as nitrate of silver, extending its action at the same time, to parts more deeply situated.

This salt is extensively used as an escharotic application to inflamed dentine. Of course it should never be used when it is practicable to restore the inflamed part to its normal condition. The subjacent tissues are left in a healthier condition after its use than after nitrate of silver, and some other caustics, but the loss of substance is greater.

The oxy-chloride of zinc, made by simply dissolving zinc in hydrochloric acid, is a good flux for almost any of the soft solders which the mechanical dentist may wish to use incidentally, in the laboratory.

Chloride of Silver. (Ag. Cl.=143.42.)

This compound, known as horn-silver, by mineralogists, may be generated by heating silver in chlorine gas, or by mixing hydrochloric acid, or any soluble chloride, with a solution of

nitrate of silver. The most convenient precipitant is the chloride of sodium, or common salt. When common gold coin, or any alloy containing silver, is dissolved in aqua regia, the silver is found at the bottom of the vessel, in the form of chloride. When first precipitated it is white, but by exposure to light, it soon becomes almost black.

It is insoluble in water, and but sparingly soluble in the stronger acids. It is readily dissolved in ammonia. It fuses at about 500°, and is then a yellow liquid, which on solidifying becomes a semi-transparent horny mass, identical with the native horn-silver. It bears almost any degree of heat without change, but is readily decomposed by hydrogen. A convenient method of effecting this is to place the chloride in a glass jar, add granulated zinc and dilute sulphuric acid. The hydrogen thus disengaged seizes the chlorine, forming hydrochloric acid, which escapes as gas, leaving the silver in minute granules, in the bottom of the jar. The zinc must all be dissolved, by the sulphuric acid, and the sulphate of zinc being soluble, is easily removed by washing and decantation. This decomposition is thus illustrated.

$$Ag.\ Cl. + H. = Ag. + HCl.$$

Chlorides of Gold.—When gold is dissolved in aqua regia and the solution sufficiently concentrated by evaporation, very fusible, ruby red prismatic crystals are obtained. By heating these crystals to about 600°, we obtain an insoluble, yellow substance, the

Protochloride of Gold. (Au. Cl.=234.62.)

By boiling in water, the protochloride is resolved into the terchloride, and metallic gold. At a red heat it loses all its chlorine, and metallic gold remains. It is unimportant to the dentist.

Terchloride of Gold. (Au. Cl. 3 = 305.46.)

The crystals above described are composed of the terchloride of gold. In this form, gold is usually, and most conveniently dissolved. It is readily decomposed by protosulphate of iron, by which the metal is thrown down, as a brown powder,

and the solution contains sesquisulphate of peroxyd, and terchloride of iron. The reaction is as follows:

$$6\,(Fe.OSO\,3)+Au.\,Cl.3=2(Fe.\;2\,O\,3\;3SO\,3.)+Fe.2\,Cl3+Au.$$

Slight traces of iron sometimes adhere to the precipitate but they are easily removed by washing with dilute hydrochloric acid.

Nitrate of mercury, most of the metals, sulphurous, phosphorous, and oxalic acid, also decompose it, and precipitate the gold.

The terchloride of gold is soluble in water, alcohol, and ether. The ethereal solution is an admirable escharotic application to inflamed dentine. The indications for its use are the same as those for chloride of zinc. It is conveniently prepared by evaporating the ordinary solution of gold, till the formation of crystals commences; then dissolve the residue in water, and add, in a vial, an equal volume of sulphuric ether and agitate. Two fluids will result, the lighter of which is the ethereal solution of terchloride of gold. It may be poured into a separate vial, closely corked, and set in a dark place for future use. The gold may be precipitated from the remaining solution with sulphate of iron.

When the ethereal solution is applied to a tooth, the terchloride is almost instantly decomposed, and the three equivalents of chlorine thus liberated, act with the energy peculiar to the nascent state, and the result is that the vitality of the inflamed dentine is instantly destroyed, and with far less pain than results from chloride of zinc, or any other escharotic that I have used. It is probable also that the presence of the ether has some influence over the pain.—*Dental Register.*

ARTICLE XIII.

Crystallized Gold.

When Dr. Watts first attempted to prepare a form of sponge or crystalline gold for filling teeth, he experienced great difficulty from his ignorance of the details of dentistry. If he had been thoroughly acquainted with the modes of manipulation by which unexceptionable gold plugs were produced in the mouth, and with the varied influences by which their integrity may be subsequently endangered or destroyed, the profession and himself would have been saved a great deal of time, trouble, expense and mortification. Being, however, professionally and practically a chemist, he was obliged to appeal to dentists for their judgment and counsel. With this view he submitted a form of prepared gold to a few of the best operators with whom he was at that time acquainted, and upon whose judgment he thought he could most safely rely.

To these persons it was a new and extraordinary thing. Its singular qualities—the peculiar mode of using it—and the results attained with it, were equally remarkable. They were "astonished," "delighted;" in the heat of enthusiasm, reported it, "the greatest discovery of the age," and in letters to the Dr., it was lauded without limit, and set down as already a "perfect" thing. It was further said, that slight experience would enable comparatively unskillful persons to accomplish better work with it than could be produced with foil in the hands of operators of tried skill and large experience; that its use required less time than foil, while it could hardly be said to require *skill* at all. All this occurred before the gold had been offered for sale, or any directions published for its use.

The truth was, that crystal gold at this period should have been subjected to rigid critical trials and tests, particularly the "test of time," that Dr. W. might have had an opportunity to remedy its defects and perfect its character; but, he was un-

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fortunately led to believe his first article to be all that the profession desired, and the prepared gold was therefore sent out to the world, accompanied by "directions" entirely authorized by the honest but incautious judgment so far rendered upon it. The profession were therein told that crystal gold required for its successful use, comparatively little time and skill, and that no specific instruments were necessary—the end of a broken file "working admirably!"

This was a great blunder—more—it was a *disaster!* It not only justified, but directed carelessness, and gave an entirely mistaken idea of the requirements and qualities of the gold. If a dentist, with some clumsy tool, perhaps the "broken file" aforesaid, filled a large cavity, half prepared, and the plug, less than half condensed, subsequently came out or went to pieces, he had followed "directions," and charged the failure to the "gold."—The "directions" were at fault, sadly, entirely, yet in preparing them, the Dr. had been misled, as just stated.

As might be supposed, or, at least, as we can now plainly see, crystal gold sent out in this way, met with a singular reception. The too sanguine operator, expecting too much with inadequate labor—with instruments, at best inappropriate, and most likely none at all to the purpose—released from any obligation to practice proper skill and care, essayed to fill teeth with sponge gold, and at once encountered difficulties. The Dr. was straightway inundated with letters from all directions; the general idea pervading them seemed to be, that the writers had discovered valuable qualities in the new material, which they were anxious to make available to the fullest extent, and each would suggest some specific change, which would improve it for *his* purpose. One wanted it harder—another softer—with one, it crumbled, was too adhesive, or not adhesive enough, and so on; and here the Dr. committed the second great error.

Being so perfectly conversant with the laws regulating the crystallization of gold, in the large field opened up by his discoveries, as to be able, at pleasure, to vary the qualities and characteristics of the new material, and only anxious to learn what precise form of production the profession *wanted*, he ac-

tually undertook to manufacture varieties differing sufficiently in character to please this whole mass of correspondents; hoping, thereby, to hit upon the *single* form which would please them *all*. A great amount of time and money was wasted in this effort, and herein is the real cause of the great number of forms and qualities of prepared gold which have been manufactured here and sent over the country; their number and variety being distracting to the Dr. as well as the profession, and giving just cause for what came to be the general belief, that this diversity arose from some difficulty in the process of manufacture, and that uniformity was really unattainable, *which neither is, nor has, at any time, been true.*

The great confusion produced in the laboratory by attempting so many changes and modifications, necessarily interfered with the regular details of the manufacture, and hence it was, that impurities occasionally escaped detection. This accounts for the discolorations that have been noticed, a result deplorable in the extreme, but now most certainly and reliably guarded against.

This defect was, as we state, purely accidental; the process of manufacture involves no sort of necessity or excuse for the slightest impurity, and our determination to manufacture but the one variety, affords an additional security from such hazard.

In the course of this general effort to please everybody, a series of dark-brown, or wine-colored formations were produced, which possessed peculiar properties. Although not so yielding or plastic in the mass as the brighter forms, they were greatly admired for their *adhesiveness*, and had at once many friends. The general report coming to us, was, that the brown varieties wasted more or less, but readily adhered on pressure, while the bright varieties did not waste at all, and did not adhere so well.

Experience has since demonstrated the following facts in reference to these two varieties of prepared gold:

The bright forms, upon comparatively slight pressure, condense *solid*. If the face of the instrument used is *smooth*, though *uneven*, the added piece does not adhere, but comes up, taking a *perfect impression* of the portion already condensed;

so perfect is its plasticity, and so fine its structure, that it will take a perfect impression of the most delicate etching, on steel or copper-plate, and completely render every inequality visible through a microscope of high power. But this very quality, invaluable, and *perfect* in this material, requires that it should be continually worked with *sharply and finely cut surfaces*, that the bearing surface of instruments should be always *kept* sharp, in order that the working surface of the plug may remain sufficiently rough for the new gold to obtain a hold upon it. The *chief* almost *sole* requirement of this gold, is *proper tools;* and the profession, as a mass, had anything but proper tools.

On the other hand, the brown varieties were more deceptive in their character, and by reason of their greater adhesiveness. The operator could, with the imperfect instruments then in use, and with a certain amount of pressure, produce plugs which were very hard, and to all appearance solid; but which, when examined by the aid of the microscope, were found to be not solid but porous.

It was into the (to the eye) invisible, but innumerable interstices of the apparently condensed mass, that the added gold insinuated itself. Though packed with comparatively smooth instruments, it would still, in this way, adhere finely; and yet this quality of adhesion was due to an imperfection. Operations of this character failed, would crumble to pieces and fall out, authorizing the statements about brick-dust, &c. A greater amount of pressure would make a plug more lasting in its character, but still leave it sufficiently porous to admit of the absorption of moisture. Still greater pressure would obviate the danger from the absorption of fluids, and yet leave the plug lighter than perfectly solid gold. And though perfectly solid plugs have been, and can at any time be made with it, such result required very perfect instruments, great labor, time and patience.

Nine-tenths of all the complaints which have been made against crystal gold—well-founded, ill-founded and unfounded—except, perhaps, the more or less slight tendency to crumbling, and, therefore, waste, which distinguished all the earlier pro-

ductions, are due to these brown varieties, aided by the want of proper instructions and appropriate and well made instruments.

From all this, it became evident that crystal gold had pressing need of tools made for and adapted to itself. We at once determined to publish a popular treatise on the qualities and use of the gold, embodying all the available experience of skillful and successful operators, in regard to instruments. Dr. Dwinelle, of Cazenovia, N. Y., who had great experience in the use of all forms of crystal gold, and who was, with unvarying certainty and success, accomplishing with it the most astonishing triumphs, prepared this "Treatise" for us in an able and satisfactory manner, its sole defect consisting in the inability to distinctly represent, by means of plates, the most important peculiarities of the instruments.—We furthermore resolved to modify the character of the dark varieties, gradually approaching, as nearly as possible, the brighter forms, and, so soon as the "Treatise" and right instruments could be prepared, to cease their manufacture altogether. Accordingly, since about the first of July last, none of the brown varieties have been made.

Now, although in the hands of the same operator, *with right instruments*, there could be no just comparison, in all essential characteristics, between what we have termed the brown and bright varieties, yet we feared to let this *best* material go at once out among the profession, to be manipulated and tested with the instruments in general use, although we had, perhaps, from being originally misled, as before stated, contributed more than all others, to introduce and justify the use of poor tools. We, therefore, refused the repeated request of Dr. Dwinelle, and others, (that we would send it out,) solely on the grounds stated, that some general knowledge of the characteristics of crystal gold, and some specific knowledge of proper instruments should precede its general introduction. Our course, in this respect, has given offence to some persons, and we *may* have been wrong, but when the experienced dentists, with the *best* of instruments, shall try his hand upon the gold *now* sent out from this establishment, we think he will endorse our course, and thank us for it.

The "Treatise" and the efforts of manufacturers of dental instruments, to whom we are under obligations, have so far removed this difficulty, however, that this "reserved" gold is now *only* manufactured.

This highly "improved," and as we regard it, "*perfected*" article, is claimed to be free from the objections which have been urged against any previous form of sponge or crystal gold. It is soft, silky, not friable, condenses readily, makes a perfectly solid plug, with less pressure than the other varieties, and will not change in color, permanence, or other characteristics, in or out of the mouth, in the least. We are entirely aware of the great breadth of this statement, but we are willing to put every thing at hazard on its absolute truthfulnes. It *must*, (we have explained why,) be used with finely and sharply cut points, and be thoroughly condensed, yet it requires less pressure, to secure perfect consolidation, than any other form of gold now used.

We know that the varying character of crystalline gold, as heretofore made, its often real defects, and the difficulty, in most cases impossibility, of obtaining fit instruments, have prejudiced and weaned many from its use altogether. Yet the universal response to us proves that few such as have failed to discover qualities which would render it invaluable in their hands if not linked to imperfections in the material and uncertainty in the manufacture. To all such, and the entire dental profession, we say that the period of trial, experiment, change and uncertainty has passed. We make and abide by the merits of but one form of gold—uniform in all respects, except in the differing density which distinguishes the various numbers—susceptible of every use, and competent to every triumph which the most ardent admirer has ever hoped to accomplish with it.

A. J. Watts & Co.

Utica, N. Y., October 27th, 1855.

All persons having prepared gold, manufactured by us previous to the first of July last, are requested to forward the same to us, and exchange it for the perfected article.

A. J. W. & Co.

ARTICLE XIV.

Means of Counteracting the Effects of Chloroform.

In the *Gazette des Hopitaux* of September, we find a notice of a session of the Society of Practical Medicine, containing a report by M. Ferrier upon a communication of M. Ludger Lallemant on the relative value of different agents to neutralize the deadly effects of chloroform.

After detailing the usual phenomena of anæsthesia as exhibited in man and the lower animals, the report continues:

"Among the means of opposing the poisonous effects of chloroform, experimentists have tried inflation of the lungs with pure oxygen and also with atmospheric air, electricity, irritation of the phrenic nerves, and stimulating the pharynx with caustic ammonia.

"The success obtained by inflating with oxygen, has been equalled by the happy results obtained by the use of atmospheric air alone; and authors who have tried with success azote, are convinced that the result should be attributed rather to the irritating action of the gas brought into contact with the walls of the bronchial tubes than to any specific effect in the air cells. They have therefore given the preference to inflation with atmospheric air as the most simple, and of sufficiently easy application by means of a gum elastic tube provided with a mouth piece; which, in experiments with dogs, has been introduced into the larynx, or simply into the back part of the mouth in rabbits. The inflation should always be made to alternate with pressure regularly applied to the chest.

Electricity proposed by MM. Jobert and Abeille has not succeeded in the hands of experimenters. Irritation of the phrenic nerves, suggested by M. Duchenne, of Boulogne, having for its object to restore the regular action of the intercostal muscles, has appeared, on the other hand, to be equally successful with

the inflations. The use of caustic ammonia, according to the process of M. J. Galrin, has failed.

"Inflation, as the means of bringing to life the subjects of an excessive employment of anæsthetics, has been of no benefit except in the cases where it has been used immediately after the cessation of respiration, rarely after the heart has ceased to beat. It is necessary also that inflation should be continued with perseverance and energy, until the normal and spontaneous movements of respiration are fully established.

"It has been remarked, also, that under the influence of anæsthesia the nervous centres and spinal marrow, having become insensible to the touch, are also insensible to the stimulus of the galvanic pile, but the agitation produced by galvanism speedily exhausts the remaining nervous irritability, which very seldom is sufficient to react upon the phrenic nerves to a degree required to establish normal respiration.

"Autopsies have also established that chloroform accumulates in the lungs, but particularly in large quantities in the brain, all parts of which disengage a strong odor of this anæsthetic, which seems to prove that this organ is the place of election of the agent, of which the deadly effects are in proportion to the quantity of the vapor respired."

A discussion followed as to the best method of inflating the lungs in the case in question, it being contended that it was a very difficult thing to do; one member suggesting tracheotomy as the only sure method, and another inquiring how it was possible to introduce the sound into the larynx.

"M. Ferrier replied, that daily experience proves that inflation is less difficult than it is thought to be, and that air blown in by the nasal passages penetrates to the lungs. To introduce the sound, the instrument having been passed to the upper part of the pharynx, it is easy to raise the glottis and slip it into the larynx."

The conclusions of the report were adopted.

ARTICLE XV.

Death from Inhalation of Chloroform, in Edinburgh.

As Edinburgh has so long enjoyed an almost complete immunity from accidents resulting from the use of chloroform, the following case, which is reported in the *Edinburgh Medical Journal,* is worthy of attention. A lady, aged 36 years, called on Dr. W. A. Roberts, in order to have some teeth extracted. As she had inhaled chloroform once, during an accouchement, and as Dr. R. had also administered it to her on *four* previous occasions during the past year, he consented to employ it. She had only taken about nine or ten inspirations, when, in less than a minute from the time she began to inhale, *and while speaking*, she gave a convulsive start, and with a stertorous inspiration, and the eyes and mouth wide open, sunk to the floor. Dr. Simpson, being near at hand, was sent for, and arrived in less than five minutes, with Dr. Priestley. The means employed for relief, were artificial respiration, galvanism, and bleeding, though only a few ounces of blood could be obtained. After artificial respiration had been carried on for some time, spontaneous inspiration took place, the pulse became distinct, and the lividity of the face in a great measure disappeared. But these favorable indications ultimately declined, and after one hour and a quarter of the most energetic exertions (especially on the part of Dr. Simpson,) the case was reluctantly abandoned as hopeless, life being manifestly extinct.

At the *post-mortem* examination, the chief morbid appearances were found in the heart. This organ was very small, the right side flaccid and full of blood, the left firm and con tracted. The walls of the right side were unusually thin, and their tissue was soft and lacerable. Under the microscope, the muscular fibres of the right ventrical were much altered in appearance; the transverse striæ were indistinct, or had entirely disappeared in some portions, while fatty granules were every-

where observable, arranged in lines along the direction of the fibres.

The father of the patient had died of disease of the heart, being found dead in his chair.—*Bos. Med. & Sur. Jour.*

ARTICLE XVI.

Case of Rupture of the Uterus, and Recovery. By W. W. Duvall, M. D., of Prince George's County, Md.

June 8, 1854, I was called to see —— ——, who had been in labor twelve hours; but, for four hours previous to my visit, there had been an entire suspension of uterine effort. Upon examination, the shoulder was found presenting. Turning the child, delivery by the feet was resorted to and effected with but little difficulty and delay—the child being dead. The uterus being passive the placenta was retained, and as there was considerable hemorrhage, its extraction was deemed necessary, which was done—it being detached from the uterus, and lying near its mouth. The hemorrhage not ceasing, or abating, so far as to render the patient's condition one of safety, it was thought advisable to introduce the hand to provoke contraction, and upon so doing, I perceived a transverse rent in the walls of the uterus, about three inches above the cervix, anteriorly, through which I could easily pass my index, middle, and ring fingers. The patient being much exhausted, a neat and efficient bandage was applied around the abdomen. She was enjoined to lie upon her back, and opiates and cordials were administered. The lochial flux was excessive for several days, followed by sero-sanguineous, and then purulent discharge, which continued for several weeks, accompanied by irritative fever and diarrhea. The patient had borne three children previously, and the presumption is that the laceration occurred by the violent and unavailing efforts of the organ under the malpresentation, as there was but

slight effort required in turning the child. Since her recovery, she has enjoyed good health, menstruating regularly—having lived absque marito.—*Amer. Jour. of the Med. Sciences.*

ARTICLE XVII.

Electrotype Manipulation.—Part II.

I.—Introductory Observations.—92. Having in Part I given the mode of working in copper, we now pass to other metals. First in importance come gold and silver. The earliest experiments in electro-gilding were those by Brugnatelli, who gilded silver medals by electricity, in 1805; he used a solution of nitro-muriate of gold, mixed with a solution of ammonia. The next were those of De la Rive, 1841, who used a solution of chloride of gold. But these processes were interesting rather in a theoretrical than in a practical point of view; inasmuch as the elective chemical affinity of the elements (combined in these solutions with the gold) for the baser metals, which might be immersed in the solutions, is such, that a violent interchange of elements takes place, and the gold is set free without even electric agency; and the solutions are so readily decomposed by the smallest adventitious aid, that it is a practical impossibility to obtain a "reguline" deposit, however much the voltaic power may be modified.

The following are illustrations of the deposition of gold and silver by the mere elective affinity or ordinary chemical action. If an aqueous solution of chloride of gold is agitated with ether, the chlorine leaves the water to combine with the ether, and the resulting compound, being lighter than water, floats on the surface.—If pieces of polished steel are dipped into this preparation they acquire a coat of gold by ordinary chemical interchange.—If a design is traced with solution of chloride of gold upon a silk or linen fabric, and the fabric, while the traces are still moist, be exposed to a stream of hydrogen gas

(which may readily be obtained by acting upon iron nails by diluted sulphuric acid,) the metal is reduced, and a golden design is the result.—If a plaster cast is saturated with a solution of nitrate of silver, and placed under a bell-glass, and we admit to it the gas produced by heating a few grains of phosphorus with alcohol and a small quantity of potash, the silver will be reduced upon the surface.—If the plaster-cast is made with sour whey instead of water, and is saturated with silver solution, the silver is reduced by mere exposure to sunlight, and forms, according to Elsren, a good conducting surface, in which we can deposit copper or silver according to the usual modes.

The same observations apply to the ordinary salts of silver, as, for example, the nitrate, &c. In fact, long before the theory of chemical deposits was understood, I made some experiments upon the electrolysis of this salt, and succeeded in producing an electrotype medal with a *silver* surface, being I think the *first* instance of electro-plating, when the *object of the experiment was electro-plating.* But I was unsuccessful in my attempts to repeat the experiments; and simply because, in that instance, I *chanced* to have in action a power nicely *balanced* with the work to be performed, but in future instances my power was not adjusted to the work.

93. The first practical process for working in these noble metals is undoubtedly due to the patentees, Messrs. Elkington. Others have laid claim to having been the first to use solutions similar to theirs; but whatever may have been done by these others in private, it does not appear that the public were in possession of their processes by any authentic publication; and therefore there is no alternative but to give the patentees the claim of originality and priority.

94. The solutions they employ are the *argento-cyanide* and the *auro-cyanide* of potassium; upon which compounds it will be well if we make a few observations here, at the outset. They are what the chemist term double salts: as, for instance, *cyanide of potassium* is a compound simply of potassium and cyanogen; *argento-cyanide of potassium* is silver and cyanogen combined with potassium and cyanogen, or, which amounts to the same thing, cyanide of silver united with cyanide of potassium.

When viewing (§ 13) what happened during the decomposition of sulphate of copper, we had occasion to describe that body as *oxyd of copper*, dissolved in, or combined with, *sulphuric acid:* now, oxyd of copper is 1 part copper + 1 part oxygen, and sulphuric acid is 1 part sulphur + 3 parts oxygen, and a certain quantity of water; so that, altogether, the arrangement is somewhat complex. This is not so much the case with the bodies now in question. And first, in respect to the simple *cyanide of potassium*, before it is united with the gold or silver. It consists simply of one equivalent of the metal potassium, and one equivalent of cyanogen; and, when it is acted upon by a voltaic current in the usual way, it appears to be decomposed by *direct* action, and cyanogen is liberated at the one pole, and potassium is *determined* to the other, but not *liberated.* It will be remembered (§ 13) that, in the solution of sulphate of copper, *water* was decomposed by the *direct* action, and that the copper was liberated by a *secondary* action, namely, by the hydrogen of the water returning back into solution in the place of the copper. Well; the cyanide of potassium is decomposed by *direct* action, and potassium is presented to the negative metal; but a *secondary* action now occurs: so great is the affinity of potassium for oxygen, that it cannot exist in a metallic form in presence of that element; as is well known from the common experiment of dropping a piece of potassium upon water, when it combines so violently with the oxygen as to produce heat and light; and the resulting products are oxyd of potassium, the common *caustic potash*, accompanied with a liberation of hydrogen. So, also, in the present case; the potassium does not itself appear, but, in its place we find hydrogen and potash; it takes oxygen from the water and forms potash, and sets the hydrogen free. It is true, we are in possession of a means of preventing its return into solution, and this is by employing a mass of mercury to receive it: in which case it unites with the mercury and forms the amalgam of potassium; and neither hydrogen nor potash is manifested; but it will remain thus only under favorable circumstances; for, if the connections with the battery are broken, so that the mer-

cury ceases to be negatively electrified, the potassium immediately leaves it, and decomposes the water as before. Thus much in reference to the simple cyanide of potassium. Of the double cyanides, the argento may be taken as an example. It consists of 1 part cyanide of potassium and 1 part cyanide of silver—the latter cyanide, like the former, consisting of 1 part metal+1 cyanogen. When a solution of this double cyanide is electrolized, silver appears at one pole, and cyanogen at the other. But in order to the production of this result, it is absolutely essential that there be a considerable surplus quantity of the cyanide of potassium in solution; indeed, it is pretty evident that the direct action is the decomposition of the surplus cyanide, and that the silver is reduced by secondary action in the following way. When the metal potassium is reduced from its cyanide, it returns into solution, and takes the place of the silver in the double salt, setting the latter metal free; so that, while on the one hand an equivalent of simple cyanide is consumed, on the other hand an equivalent is formed, and the equivalent previously engaged to form with the silver the double salt, is also free; and thus far there is an increase in the quantity of simple cyanide of potassium. But, if the positive metal is silver, the cyanogen combines with it and forms cyanide of silver; for cyanogen is a gas, and like oxygen seems to combine with metals in this its nascent state; though, unlike oxygen, it is a compound body, consisting of two equivalents of carbon + 1 of nitrogen, whence it is also termed bicarburet of nitrogen. Well; cyanide of silver is insoluble in water, and hence would form an insulating crust on the silver plate were it not for the presence of cyanide of potassium in excess in solution; it readily dissolves in this, and so keeps up the strength of the solution and the extra element of cyanide of potassium, mentioned above, is thus neutralized.

Having thus described the general character of the cyanide solution, it remains for us to give the processes by which the several elements are most favorably brought together.

95. *Cyanide of Potassium.*—To obtain this, we set out with the ferro-cyanuret of potassium, or yellow prussiate of potash

of commerce; and as this prussiate is readily accessible at all chemists, it is better in general to purchase than to make it; the mode by which it is obtained will be found in any treatise on chemistry. It consists of 1 equivalent of cyanide of iron + 2 equivalents of cyanide of potassium. It is of a bright yellow color, and is converted into the colorless simple cyanuret in the following manner. Take 4 oz. of the yellow prussiate, break it in small pieces, and dry it well on a plate of iron; then reduce it in a mortar to exceedingly fine powder. Dry and pound in like manner $1\frac{1}{2}$ oz. of carbonate of potash. Incorporate the two ingredients thoroughly. Place a Hessian crucible in the fire; and when it attains a red heat, throw into it the prepared mixture, and closely cover the crucible. Keep up the heat, and the contents of the curcible will soon fuse, and the fluid mass will become redhot. After this, immerse in it, from time to time, a hot glass rod; the mass that adheres to the rod in the early stages of the process is brown on cooling; as the heat is continued, it appears yellowish, and finally colorless and transparent. The operation is then complete; the crucible must be removed; and after its contents have been allowed to settle, the fused mass may be poured off; the greater portion of which consists of the *simple cyanuret of potassium.** The impurities contained in this product are not detrimental to its use, in a general way, for the purposes in view; however, in cases where it is required pure, it must be boiled in strong alcohol; and when the alcohol cools, the pure cyanide will be deposited in the form of small white crystals. This salt is very deliquescent, and must therefore be retained in close bottles; it will readily be recognized by its powerful odor—similar to that produced by peach-blossoms. The mere mention of *prussic acid* almost entering into its composition will be sufficient to induce my readers to exercise common caution in handling it.—A solvent solution is prepared by adding two ounces of this salt to a pint of rain or distilled water; when the salt is well dissolved, the liquid is ready for use.

*This method was first described by Messrs. Rodgers, in the *Philosophical Magazine* for Feb. 1834; and since by Prof. Liebig.

96. *Silver Solution.*—Silver may be presented to the above solution in various forms; as the oxyd, the chloride, the carbonate, the nitrate, &c.; solution will in either case occur; and the double cyanide of silver and potassium will be produced. But since the silver, as we hinted before, must become a cyanide of silver before it can thus unite with the cyanide of potassium, it is obvious that one portion of the solution must give up its cyanogen to the silver, and take to itself the bodies previously in combination with that metal. So that, from the oxyd of silver, potash would occur in the solution; from chloride, chloride of potassa; from carbonate, carbonate of potassa; and from nitrate, saltpetre. Of these the least likely to interfere with this general action is the potash; and hence oxyd of silver has been frequently used. It is thus prepared:—

97. *Oxyd of Silver.*—Place pieces of silver in a glass vessel, and pour on them about equal parts of water and strong nitric acid; the metal will soon dissolve, giving off fumes of nitric oxyd. Should the solution have a green hue, which is invariably the case unless the metal has been obtained fine from the refiners, it indicates the presence of copper; in which case immerse some pieces of copper in the solution, and the nitric acid, by elective affinity, will combine with the copper; and a precipitate of pure silver, in the form of a grayish powder, will take place. Throw away the liquid, and wash the silver precipitate several times in sulphuric acid and water, and afterwards in water alone. Then redissolve it, as before, in nitric acid and water; and a *solution of pure nitrate of silver* will be obtained. Place this in an evaporating dish, or a saucer, and apply the heat of a spirit-lamp, or place the saucer by the fireside, till some portion of the liquid is driven off in vapor. Allow the residue to cool, and it will shoot out into long, colorless, transparent crystals which are *nitrate of silver.* They must be handled with care, as they possess the property of staining animal and vegetable substances with an almost indelible black; fused nitrate of silver being the lunar caustic of surgery, aud the main ingredient also of marking-ink.—Next prepare some *lime-water*, by stirring lime into water, and filtering the solution. As lime

is very sparingly soluble in water, requiring at 60° Fahrenheit 750 times its weight, it is necessary to make an abundant supply. Place the lime-water in a glass or other vessel, and drop in it a *few* crystals of nitrate of silver: the colorless solution will instantly assume an unsightly brown hue; and, after remaining quiescent for a time, the *oxyd of silver* will subside in the form of a dark brown precipitate. The liquid is then poured off, and the precipitate is washed with water. Before throwing away the liquid, fresh lime-water should be added to it; and if the dark hue recurs, the precipitate must be allowed to subside again: if no change takes place, it may be inferred that the silver is all extracted. The oxyd of silver should not be dried, but be kept in bottles with water. A quarter of an ounce of oxyd of silver, added to a pint of the solvent solution, forms a very useful plating solution.

98. *Cyanide of Silver.*—But, as the above solution is impure, in that it contains as much potash as is equivalent to the oxyd of silver added, it may not be applicable to accurate experiments; and as the potash is produced, in the formation of cyanide of silver, at the expense of a certain portion of the cyanide of potassium, it is a wise plan, for it is no more costly, to form the cyanide of silver in a separate vessel, and to wash away the impurities before adding it to the solvent. Take then a neutral solution of nitrate of silver; add carefully a solution of cyanide of potassium, when a white precipitate of cyanide of silver will fall; continue adding until precipitation ceases. The liquid, which is a solution of nitrate of potash or saltpetre, is to be poured off, and the precipitate well washed. It will be pure cyanide of silver, if the materials employed were pure; and it is now fit to be added to the solvent liquid, to form a plating solution free from impurities.

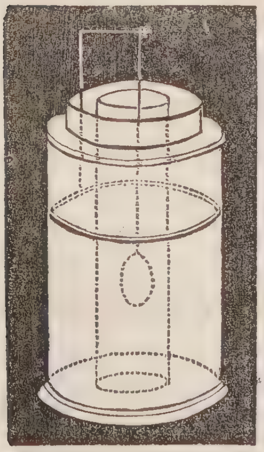
99. *Preparation of the Gold Solution.*—Warm a pint of pure rain or distilled water, and dissolve in it two ounces of cyanide of potassium as before; then add a quarter of an ounce of oxyd of gold. The solution will at first be yellowish, but will soon subside to colorless transparency. Those not versed in chemical manipulation will be wiser to purchase than to pre-

pare oxyd of gold; but, for general information, I give the process. Dissolve pure gold in two measures of muriatic with one of nitric acid; evaporate to dryness; dissolve the residuum in twelve times its weight of water; add to this a solution of pure carbonate of potash, dissolved in twice its weight of water; apply a moderate heat, about 170°, and a reddish-yellow precipitate occurs. This is the *hydrated* peroxyd of gold. Wash it well; and, to render it anhydrous, boil it in water. It then assumes a brownish-black color, which is the oxyd required.

100. I by no means give these as *standard* proportions of the several ingredients required. They are the proportions which I employed with success in gilding and plating the series of metals (submitted to the Electrical Society at their meeting, Sept. 21, 1841,) by the battery process to be hereafter described. When the same object is effected by the employment of a single cell, it will be requisite to alter the degree of saturation according to circumstances; to which, however, I shall have further to allude in the sequel.

101. *Single Cell for Plating and Gilding.*—The necessity of economizing solutions of such value as these has led to certain modifications in the apparatus contributing to that end. The porous cell (§ 17,) which in other arrangements contains the *zinc* and acid, and is surrounded by the copper or other negative element, in the present process contains the *cyanide solution*, and the negative element or object to receive the deposit, and is surrounded by the zinc, &c.

Fig. 11.



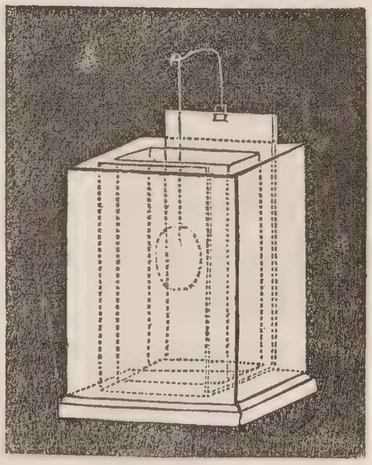
102. This arrangement will be readily understood by a glance at the annexed wood-cut, which represents a porcelain cell containing a cylinder of zinc, and an inner porous tube filled with the solution of silver or gold. Connection is made between the zinc and medal or mould by a binding screw; or by a mere contact, as in the figure.

103. I must again dwell upon the philosophy of the action of this arrangement, and return to first principles, in order to impress

them more firmly on the minds of those who read these pages with the intent to repeat the experiments. For it is a matter of some importance, in employing the costly salts of the noble metals, to have the principles of the experiment traced out as distinctly as possible.

104. In the arrangement just described, the nature of the deposit will depend upon the principles elsewhere (§ 78) set forth; and *à fortiori*, from the facility with which the salts of silver or gold are decomposed, there will be a much *greater* chance of releasing hydrogen, and spoiling the experiment; to prevent which, therefore, ample provision must be made. For instance, if the silver solution is *weak* in proportion to the *energy* of action between the zinc and acid water, the electricity developed will be *more* than sufficient to release pure metal, and hydrogen will be evolved, the result being a deposition of oxyd. Or, if the balance between the strength of the solutions be duly adjusted, the relation between the size of the zinc and of the medal or mould may be such as to determine the same result. It is therefore requisite that the water which excites the zinc should contain *very little acid*—a few drops, more or less in proportion as the cyanide solution contains more or less of the oxyd; and that the strength of the latter should be maintained by a fresh supply of oxyd from time to time.

Fig. 12.



105. Another, and in some cases more convenient form for the single-cell apparatus is given in the annexed woodcut; in principle it differs from the former; the porous cell to contain the cyanide solution being flat, affords the means of immersing a larger medal, without an extravagant supply of liquid. The zinc which envelops the porous cell is also flat. The connections are made as before.

106. *Plating by means of a single Cell.*—Having charged either of these arrangements with the weak acid water and the solution of silver, let it remain for a few minutes, in order that

the porous cell may be moistened through, and that action may commence as soon as the circuit is completed. Then attach a *thin*,* pliable wire to the medal or mould, and place its other end in contact with the wire attached to the zinc: complete the circuit by immersing the metal in the silver solution, and a disposition will *instantly* take place. It will present a *dead* whitish appearance. At the meeting of the British Association in Birmingham, in 1849, Mr. Elkington stated, "that a few drops of the sulphuret of carbon, added to the cyanide of silver in the decomposing cell, had the property of precipitating the silver perfectly bright, instead of being granulated so dead as it is when thrown down from the solutions ordinarily employed."

107. Should the silver deposit present a whitish surface, streaked with perpendicular *black* lines, it may be regarded as an indication that the action is attended with a development of hydrogen: this must be prevented by some of the means so often mentioned (§ 78, &c.) By careful attention at the commencement of the process the right degree of action is readily obtained; and if the process is continued (with occasional watching) for about half an hour, the medal will be beautifully coated with *dead* silver. In that condition it may remain, after being washed, and dried in blotting-paper. Or, if a burnish is desired, the leather and plate brush must be used; or it may be thrown down bright as above (§ 106.)

Mr. Bain has patented an instrument which he styles a "Voltaic Governor." The plates of the voltaic arrangement are immersed to a depth sufficient to produce the electricity required. They are suspended in the liquid as weights to a clock-work arrangement. When the action diminishes, a keeper from an electro-magnet, through which the current passes, is moved, and the plates are said to sink until enough of electricity is generated to cause the electro-magnet again to attract the keeper.†

* This principle, so often alluded to, of retarding or restraining the energy of the action, is regarded in the employment of *thin* wire; it is a very valuable adjunct to the other means (§ 78) of obtaining the same end; and may often be adopted with advantage.

† *Vide* Mech. Mag. 5th Aug. 1843.

If, instead of plating medals the object is to deposit silver in a mould, as mentioned elsewhere, the same preparations are to be made; but the mould should be allowed to remain for some minutes (more or less according to the thickness required) subject to the action of the current. It may then be removed, and after being washed with water, and afterwards with water containing a few drops of nitric acid, may be placed with proper connections in a copper solution (§ 57,) to remain there till it is sufficiently backed up with this metal.

108. *Gilding by means of a single Cell.*—The operation of gilding is conducted much in the same manner as that of plating—gilding, however, requiring a little longer time, and occasionally hot solutions.

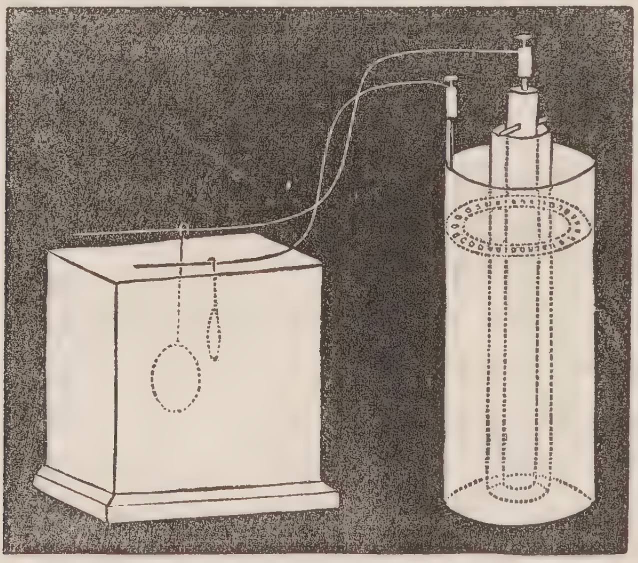
109. The operations of gilding and plating seem at first to have been very generally affected by means of the single cell, in a manner more or less in accordance with the directions I have just given, as the nature of the case permitted. In fact, *plating* by this process had been adopted on a scale of some magnitude in the great manufacturing town of England; the strength of the solution being maintained by fresh supplies of the oxyd of either gold or silver. And if attention be paid to the instructions given, there is little fear of failing.

110. Before describing a method which appears far superior to this, I would direct attention to the source whence the silver and gold in the single cell process are obtained, viz. from the *oxyds*, for instance. For every ounce of these metals deposited, a quantity of the oxyd must be furnished which shall contain in it an ounce of *pure* metal; and hence for every ounce of *metal*, much *more* than an ounce of *oxyd* is consumed. The time and trouble required to effect the combination between these metals and oxygen are by no means inconsiderable; and hence the expense of first producing the oxyd of gold or silver, and then releasing either from the after-combination with cyanogen, far exceeds the actual cost of the metal employed; *how* far depends upon circumstances. The object, however, may be accomplished with far more certainty, and at considerably less expense by means of an additional cell (§ 56,) and a plate or

wire, &c. of gold or silver, to keep up the strength of the solution, as in the case of sulphate of copper. This method is now adopted generally by several patentees; for experiments with solutions of silver and gold in union with cyanogen, have shown that *cyanogen nascent at the positive plate in a decomposition cell will combine with silver and also with gold.* This furnishes a means of gilding and plating, by the use of a generating cell to furnish the electricity, and a decomposition cell to contain the cyanide solution; the nature of the changes produced has already (§ 95) been described.

111. *Battery Process for Plating and Gilding.*—The generating cell for acting upon solutions of silver need not be large. A pint Daniell, similar to that in the wood-cut, or a series of

FIG. 13.



two, is sufficient for larger medals than can be placed in the decomposition cell attached. The latter is of porcelain or glass. Of course, the size varies according to the extent of the experiment. The zinc may be used unamalgamated, and excited with salt and water; the copper cell of the Daniell's battery contains, as usual, a solution of the sulphate (§ 57.) Gilding may be better accomplished by using three cells of Daniell's battery.

112. *Voltaic Condenser.*—Prof. De la Rive has introduced an instrument, which he has named the *Voltaic Condenser,**

* Vide *Arch de l'Elect.* No. 8, p. 173, and *Elec. Mag.* p. 38.

and which may probably be of some service in electro-gilding and plating. Its property is to give to one cell of a battery the intensity of two or three, being the power required for these processes; and it does this at the expense of only *one* equivalent of zinc. It is well known to electricians that at the moment contact is made with the battery, so as to send a voltaic current along a wire in one direction, a *secondary current*, which endures but for an instant, is induced in the wire in the reverse direction; and when contact is broken, so that the original current ceases, the secondary current is induced to move in the direction contrary to its original motion; and therefore in the *same* direction as that pursued by the primary current, when contact was first made. The intensity of this current greatly depends on the quantity, the character, and the form of the wire employed; and if the wire is coated with silk and wound round a bobbin, the intensity is greatly increased. M. De la Rive uses 100 convolutions of three stout copper wires, and places within the coil a bar of soft iron, the use of which will soon become evident. The object of the arrangement is to convey the battery current, and with it the secondary current through the solution to be decomposed.

113. For example, we will select the gold solution to illustrate the use of the *condenser*. Metallic connections are applied between the ends of the coil and the two terminations of a Daniell's or Smee's battery. The connections are continued to a vessel containing the gold solution, the arrangement being somewhat like the figure ∞, where the generating cell is to the right, the coil in the centre, and the decomposition cell to the left. The current, on leaving the battery, has thus the choice of two paths, the one being through the coil, the other through the solution; but from the great comparative resistance of liquids, compared with metals, far the larger portion would pass through the coil, while a comparatively small share would traverse the solution of gold. In passing through the coil, however, it converts the soft iron core into a magnet; this magnet instantly attracts a piece of iron, which is so arranged that on being raised, it removes a wire and thus breaks off com-

munication between the coil and the generating cell, except by means of the cell containing the solution. The current, therefore, now passes through the gold solution. But when the coil ceased to be alone in the circuit, a secondary current was induced in the same direction as the original battery current; this, therefore, joins with the said generating current, and *both pass together* through the gold solution; by which means the actual power of the battery is very greatly exalted. Now, the iron core loses most of its magnetism, as soon as the liquid is included in the circuit; and hence the piece of iron, the raising of which broke contact, falls again, and the coil is again included, when the same phenomena recur; and thus, by a continual succession of breaking and making contact, the *current of a moment*, namely, the *secondary current*, is created, and employed with very great advantages. My readers must be content with this general description; and I must trust to their own ingenuity for making arrangements agreeable to these directions.

114. *Application of Heat.*—Considerable advantage accrues in all cases of the deposition of metals where adhesion is desired, by the use of heat. It expands the baser metal, and so far opens its pores that the subsequent contraction, consequent on the effect of common temperatures, is likely to operate favorably in binding the metals together. It has other advantages, especially in gilding. The mode of heating the solutions will depend entirely on the circumstances under which the experiments are conducted. If a hot stove, or a sand-bath be at hand, the object is soon accomplished; but, in most cases, a simple plan is to use a lamp and a glass or other retort, and convey steam by a glass tube into the metallic solution, either of the single cell apparatus, or that contained in the decomposition cell.

115. With regard to the time requisite for plating and gilding, it is entirely dependent on the nature and uses of the article. The thickness of the deposit, of course, depends on the duration of the action. For medals, and such things as are not exposed to wear, a few minutes' immersion may be enough; for spoons, forks, plated goods, &c., subject to much wear, six or

eight, or even more hours; always taking care to watch the process at times, in order to prevent the occurrence of the black lines; whenever they appear, the action must be retarded. Large objects, or those which are subject to a long action, should be occasionally withdrawn, and their position should be altered; so that a uniformity of deposit may occur. *Motion* of the articles during the process has been recommended, and with some show of reason. The readiest method of producing it is to suspend the article in the solution from a common bottle-jack, and connect the latter with the battery. Or, on the large scale, when it would not be convenient to have a roasting-jack for each group of articles, it might be convenient to have a constant flow of the solution. The surface obtained in the deposition of silver by electrolysis is technically termed "dead." Medals thus coated, if care be exercised during the operation, are very beautiful, and should be prepared for the cabinet by simply washing in water. If a bright surface is desired, they are polished with a leather and plate powder (§ 107.) Ordinary plated goods are finished off by polishing and burnishing. A steel or agate burnisher is used. In articles of jewelry some parts are left dead, and others are made bright.

116. *Preparing Surfaces to unite with Gold and Silver.*—But we are going on too fast; I must return to certain things preliminary to plating and gilding, which I had passed over, in order not to interrupt the progressive illustrations of the nature and preparation of the solutions. I allude to the preparation of the surfaces, previous to applying the metals; which is a point of such paramount importance that, unless duly regarded, all subsequent operations will be futile; and it would be vain to hope for perfect adhesion between the metallic base and the deposit; the latter will rise up in blisters where the surface is not properly prepared, and can easily be rubbed off.

117. There are two methods of preparing metals for the reception of other metals—the wet way, and the dry way. The experiments of M. Becquerel and others are decidedly in favor of the latter; but, as it cannot be adopted, except in certain cases, where the work of the article is plain, and the article

itself is not delicate, it will be necessary to describe both modes. The main intent of cleansing is that the contact between the two metals may be perfect; and it effects this by removing grease and all extraneous matter, especially the oxyds, which are ever found on the surface of the less noble metals.

118. *Cleansing by the Dry Method.*—The advantage of the dry process over any in which moisture has been employed, is that, in the latter case, several seconds, at least, must always pass between the act of removing the article from its last liquid bath, and placing it in the solution of the metal to be deposited; and during this short interval, the article, or some portion of it, very frequently undergoes an alteration, trivial, indeed, but still an alteration, by the action of the air, which produces a film of oxyd, infinitely thin, it is true, yet quite enough to militate against the success of the experiment, as regards permanent adhesion. Therefore, wherever the dry process can be adopted, it is decidedly the better; although, from the very nature of the articles subject to the process, the number of cases in which it is available is very limited. The dry process is merely the operation of scouring with sand, or glass, or emery-paper, as the case may be, or with very fine powder of pumice-stone; using clean brushes, utterly free from grease. Sometimes fine files may be used; indeed, all depends on the value and character of the article operated upon. It must be remembered throughout that grease and oxyd are the great enemies to be expelled; and therefore, especial care must be taken to avoid contact with the moisture of the hand, which is of a nature to produce either.

119. *Cleansing by the Wet Method.*—The solutions employed may be divided generally into two classes, the acid and the alkaline; the action of the former is directed more towards the removal of oxyds, &c.: that of the latter to the removal of grease. As a rule, I would always follow the use of an acid bath by an alkaline, having first washed away the acid in several waters; and this may be done, whether the operation commence with an alkaline bath or not. The following are some of the modes in use; they are all effectual according to the circumstances

which give preference to one over the other: The method recommended by M. Boettiger, in his account of gilding, given in the *Annalen der Chimie und der Pharmecie*,* may be adopted. He says: "It is very necessary to rub the metal according to circumstances,† with extremely fine sand, moistened with hydrochloric acid mixed with a little chalk, so that there shall remain no trace of oxyd of copper." Another effectual method is immersing the article in a mixture technically termed "pickle." This may be made of

Sulphuric acid, ...	64 parts
Water, ...	64 "
Nitric acid, ...	32 "
Muriatic, ...	1 part.

The "pickle" is used by tying a wire round the article and immersing it for a second or two; the action is very energetic, and, of course, is not suited to the preparation of medals: for medals, the mixture should be very much diluted, and they should remain in it for a short time. A mere bath of dilute nitric acid is often used. Nitric acid, mixed with sea-salt and soot, is often rubbed on the article. Concentrated sulphuric acid and sea-salt is another mode. Of the alkaline solutions are caustic soda, or solution of soda and ammonia, or caustic soda and sal ammoniac; or the articles may be boiled in a solution of common soda or potash, which is a very good method of cleaning them.

120. Whatever solution is used, whether acid or alkaline, or the detergent paste of soot, or chalk and acid fresh water must not be spared for rinsing off all remaining traces; and the article must be dried for immediate use by pouring over it *boiling* distilled or rain water; or, if the process of deposition is not to be commenced immediately after the rinsing, it may be buried in hot or cold boxwood sawdust, until required; it may often be dried for immediate use in hot saw dust. In addition to the detergent methods already given, an ancillary

*Vol. xxxv. p. 350.

† *I. e.* when it can be done without injury to the object of experiment; and this, too, must be the guide in the application of the other modes.

means, which has been found effectual, depends upon the fact that metallic and other surfaces, after exposure to the air for some hours, become coated with a film of air so intimately as to retain it, even (as in electrotype cases) between themselves and any metal deposited upon them. In fact we have been advised, in copying large subjects by electrotype, to take advantage of this, and to allow the film to arrange itself, before the plate is submitted to the action of the battery. For it is found that the presence of this natural film very materially operates in preventing adhesion between the plates and the deposit: whereas, in the absence of the film, unless its place has been supplied by something else, other things being in order, the *two* will effectually become *one.* We are advised, too, after soldering a wire to a copper plate, to allow the latter to remain an entire day, to regain the film of air which had been driven off by the heat. Carrying out this principle, the boiling alkaline solution and the boiling water answer a double end; and hence are very effectual means of promoting perfect union between the metals. Heat operates still more favorably in causing the expansion of the metal, as I mentioned when recommending its adoption in the process itself of electric deposition. Iron may be prepared and cleaned by electrolytic action, as described elsewhere (§ 166.) In preparing steel for gilding it must be polished without oil, as the oily particles adhere so closely that it is scarcely attacked by strong muriatic acid. The last cleansing method I have seen, and it is a capital one, is to scour the surface with Calais sand, moistened by the silver or gold solution, and rubbed in with a scratch-brush.

121. *Amalgamation to promote Adhesion.*—Another method in this preparatory stage of the proceedings, to which I shall allude, is that recommended by M. Becquerel;* and which promises to be of great avail in insuring a successful termination to the experiment. After the articles are thoroughly cleaned, according to the instructions now laid down, they are dipped into a solution of proto-nitrate of mercury; when taken

* *Vide* Les Comptes Rendus, July 3, 1843.

out they are washed in abundance of water; and are then rubbed with leather, in order to promote the equal spread of the mercury. These operations are repeated until the whole surface is well coated with mercury. The ultimate character of the metallic deposit depends on the surface given to the mercury; if the employment of the leather is only such as is needed to effect the more equal diffusion of the mercury, the surface is dull or dead, and so is the deposit; whereas, if brisk friction is applied, and the mercury receives a good polish, such will be the character of the metal thrown down. And thus may burnished gold or dead gold be produced at pleasure. By adopting this method of giving a mercurial coat as the foundation for the plating or gilding (and it is especially valuable for the latter,) a double advantage accrues; the close adherance between the metals is insured—and a coating of gold of any thickness may be thrown down. The mercury is subsequently driven off by heat; either heat applied for the purpose, or the heat employed in some of the operations by which the work is finished.

122. German silver is prepared by allowing it to remain for three or four hours in a cold solution of carbonate of potash. It is then washed in cold water, and dipped into dilute nitric acid. Again washing and drying it, it is rubbed with leather; and immediately before placing it in the silver solution it is dipped into a solution of common salt, containing a little gum.

123. *Cleaning Electro-plate.*—Electro-plating, especially of dead silver, is very liable to turn yellow, after a few day's exposure to the light. M. Mourey found* that this was due to the decomposition of a cyanuret or a sub-cyanuret remaining on the silver surface on its emersion from the solution. He removes it in the following manner. The articles are covered with a thick layer of dissolved borax, and, being placed in a muffle, are submitted to a heat somewhat below cherry-red, which is sufficient to calcine the borax. They are then thrown into water acidulated with sulphuric acid, and allowed to remain.

* *Vide* Comptes Rendus, April 3, 1843, p. 660.

After being withdrawn from this, they are washed in water and dried, first in hot sawdust and then on a stove or otherwise. The result is the production of that white color so essentially requisite to dead silver, especially in articles of jewelry. I may add to this a process for cleaning tarnished silver in general, which, though not much known here, is practiced constantly by the natives in India. A few tamarinds are placed in water contained in an earthern vessel, and the silver articles are boiled in it for a time, and they emerge clean and very white.

124. *Gilding-Wax.*—The proper color is given to the surface of electro-gilding by covering it with *gilding-wax*, and heating it till the mass begins to smoke. Gilding-wax consists of the powders of saltpetre, sal ammoniac, sulphate of iron, and verdigris, mixed with melted wax. This operation removes the brassy appearance, which the surface often presents, and gives the rich gold color, on which the beauty of the work depends.

QUARTERLY SUMMARY.

1.—*The Dental News Letter, for July,* 1855, contains the report of a case of treatment of the nerve of a tooth, and almost complete formation of a new crown. BY A. B. WILLIAMS.

The tooth presented the appearance of a blackened mass of decayed bone, with three small points of sound teeth above the gum, on the anterior approximal, posterior part of the lingual, and on the posterior proximal surfaces. The spaces between these points extending below the gum. It was determined to excavate as much of the decayed bone as the painful nature of the operation would allow, and finally to remove the nerve; as the excavation of the diseased portion continued, it was discovered that the bone was *thoroughly* diseased, and the process of excavation was continued until only a thin lamina of bone covered the pulp, through which the operator thought the arsenic would readily act. The usual preparation of

arsenic, sulphate of morphia, and creosote, covered with a bit of cotton dipped in alcoholic solution of gum sandarach. The pain was so great that at the end of six hours, the preparation was removed, affording, as the operator had always observed in similar cases of destruction and removal of the nerve, instantaneous relief. On the fifth day the character of the pain indicated a high grade of inflammation of the pulp; the bone covering it was removed, when the escape of a small quantity of purulent matter gave relief. Not until the twenty-first day was the pulp in proper condition to be removed, and five days after the removal of the nerve, it was replaced with gold. In the formation of the new crown, the operator's first step was to begin packing the gold at the anterior part of the buccal edge, and carry it over to the posterior part, at the same time extending it inward to the previously filled pulp cavity. The gold was built up in this way above the level of the gum, on that side, and then in the same manner upon the lingual side. This part of the operation over, the gold was packed uniformly throughout the cavity; the filling was completed and the operator having seen it since, has every reason to believe in the perfect success of the case.

2.—*Treatment of Alveolar Abscess.*—Prof. White reports in Dental News Letter the case of Master G.——, 14 years of age, and of good constitution, who applied, suffering from abscess of both the superior front incisor teeth, in which the nerves had been destroyed by a blow, and which had the median angles broken off, almost exposing the nerve cavities. The teeth were loose and discharging pus at several points between the gums and teeth. The gums were lanced opposite the roots at two points, and deep enough to meet the pus sacks, into which were inserted teats of cottons to effect a drainage of the pus in another direction, so that the gums might contract and grow to the necks of the teeth again. "In a few days ceased discharging around the necks of the teeth and escaped through the openings made in the gum. The gums grew firmer to the teeth, the swelling subsided, and in a few weeks the teats were left out, and renewed every other day. When the gums had healed, the pulp cavities were both opened from the fractured surfaces, which showed some signs of decay; the internal walls of the cavities were

also considerably decayed; they were thoroughly cleansed and plugged to the apexes of the fangs with gold. They have not given the slightest pain or sign of abscess up to this time. The gums present a slightly blue appearance, but the teeth are as firm in their sockets as any in the mouth."—*Dental News Letter, July* 1, 1855.

3.—*Management of Light in the Performauce of Dental Operations.* By H. H. McQuillan.

The writer of this article points out the importance of the proper management of light to the dentist, and shows how a perfect knowledge of the anatomy and physiology of the eye, and of the laws governing light, and of the morbid changes induced by injudicious use of the organ, will enable us to guard against the injurious results alluded to, and after referring readers who are desirous of a more intimate knowledge of the subject to the works of Newton, Brewster and others, says,

"To the dentist a *clear* and *steady* light is a great desideratum. This can only be obtained with any certainty from the *northern sky.* The artist invariably makes choice of this light for his studio: this is true also of the daguerreotypist; and of the silk merchant desirous of displaying his goods to advantage. But it is of still greater importance to us when taking into consideration, that while it is reliable from its steadiness, it is also on account of its being a *reflected* light, less likely to prove injurious to the eye. A certain portion of the solar rays are *absorbed* by the northern sky, whilst those that are *reflected* constitute a clear and steady light, which, if properly managed, will not prove exacting upon the organ.

"That the southern light is too powerful, will be admitted by every operator of experience. I have found that even those who have contended that it is the best light to work in, invariably use ground glass windows to modify its power at certain periods of the day. Added to this, its vascillating character must act injuriously—every cloud that passes before the sun producing a marked change in the light. At one moment the operator may have a light of the greatest strength, and in a second, by the passage of a dark cloud, the object before him is only seen indistinctly, until the iris by enlarging the pupil accommodates the eye to the change; perhaps by the time this is effected the light again assumes its intensity, and the

iris now, by a responsive action, decreases the size of the pupil, so as to secure perfect vision."

Dr. McQuillan closes the article with further arguments to prove the importance and advantage to be derived from the choice of the northern light by the dentist, and the disadvantages of all others.—*Dental News Letter, July,* 1855.

4. *Dental Hygiene,* a thecrematic paper. By Joseph E. Garretson.—The proposition supported in this article is, "That in connection with local cleanliness, a daily ablution of the ears and surrounding parts in water, the temperature of the season, will—the structure and material being fair, preserve, and to a degree arrest the decay of the teeth."—*News Letter, October,* 1855.

5. *On the Use of Amalgam for Filling Teeth.* By Elisha Townsend.—The author says, "intending to make no excuse for my own tardiness in recanting a professional error, lest I should be betrayed into a justification of it, and inviting my brethren in the same category with myself to come up to the mark with as little reserve, I propose to give my present views upon the much vexed question of the propriety of the use of amalgams for filling teeth." He then goes on to relate the cases of two teeth filled in the year 1834, with the amalgam of mercury and silver; these, with a few more, (intended as experiments,) included all filled with amalgam by Dr. T., up to September, 1854. The two cases reported were still good up to the last date. He says, that his attention was called to a reconsideration by a professional friend, whose experiments had proven the fallacy of the objections urged against it. The objections were, "1st, That it became black, and discolored the teeth. 2d, That it had produced salivation. 3d, That it contracted in hardening, and, therefore, did not fill the cavity, allowing moisture to surround it, and reproduce decay." "The first of these objections," he says, "*did* exist, but is entirely removed by the present method of preparing it, which consists in adding a large portion of pure tin, and then washing the compound thoroughly with absolute alcohol. The second objection, though answered with as much certainty, may not be so easy of conclusive proof.

"I have not been able to find any one, on whose judgment I could rely, and who really knew what ptyalism was, say he had met with a case of sure and marked character. Some had met with great tumefaction of the gums, looseness of the teeth, ulceration, &c., but we know that all these conditions are present in cases where no mercury has been employed. Stopping a carious tooth with a pledget of cotton, where there is disposition to alveolar abscess, will produce great swelling. Carelessness and want of cleanliness will allow accumulations of tartar, and a consequent loosening of the teeth, accompanied by a fetor of the breath, equal in disagreeableness to the odor of ptyalism, and not very readily distinguishable from it in all cases.

"I knew of one case which was reported as one of decided salivation, and confirmed also by two physicians, which was said to come from four large amalgam fillings; the mouth was very filthy, and no care had been taken by the patient to cleanse it. She was told it was so much diseased that she must lose all her teeth, perhaps her life. This filthy mouth was cleaned, the gums properly treated, and entirely restored to health, without even removing the fillings on whose devoted heads the anathema had been poured. The mercury of the amalgam was, therefore, clearly not answerable for the symptoms in the case, and I have not been able to find any other that would better warrant the charge against the material, at least no case or fact which requires us to rule it out of practice on this apprehension

"3d. It contracted in hardening, &c. This, by actual and careful experiment, it is proven not to do. It is well known that all substances or compounds which harden by the process of crystallization, rather expand than diminish their bulk. Now an amalgam of silver and mercury hardens by this process, and, therefore, cannot contract. That it does not contract is well proved, besides, by all experience of its use in dental cavities." After some further arguments in favor of the use of amalgam, the author gives Dr. Wm. Hunter's recipe for the preparation of amalgam, as follows: "4 parts of pure silver; 5 parts pure tin. The silver to be melted in a crucible, and when partially cooled, the melted slowly added, carefully shaking the crucible while pouring in the tin; a black flux is then thrown in, and the whole is reheated; then poured into the ingot. It should be filed with a sharp keen file, which is kept for the purpose, and used for no other. A good magnet should then be care-

fully passed through it to remove any portions of steel that may have separated from the file. It is then to be bottled and ready for use."—*Dental News Letter, October*, 1855.

6.—*Springing of Plates.* By H. S. Chase, M. D.—The author of this communication offers the following method for preventing springing after the teeth are fitted to the plate; he takes a strip of copper, one inch and a quarter in width, and No. 23 of the gauge in thickness, which is to be wrapped around the case, the copper to come within an eighth of an inch of the teeth; the ends are to be fastened by means of iron, copper or platina wire passed through holes in each end of the copper and twisted. Small shaped pieces are then to be cut out of the free edge all around, forming a kind of fringe which is to be bent at right angles, making a sort of cap just deep enough for the case. Now, after the inside of the cap is oiled, the case is adjusted and plaster and sand mixed very thin are poured between the teeth and sides of the cap. The wax may in a few minutes be removed, the teeth backed, and then five minutes is sufficient to dry for soldering. The small amount of plaster renders the soldering but the work of a moment.—*Dental News Letter, October*, 1855.

7.—*Management of Light.*—Dr. McQuillan, in the News Letter for October, 1855, offers some further remarks in continuation of this subject in the July number, he says,

"When operating upon cavities situated in the palatine surface of superior incisors and canines, and the posterior approximal surfaces of molars or bicuspids, either in the upper or lower jaw, every operator has no doubt frequently found some difficulty in getting sufficient light on the surface demanding attention, to obtain a perfect view of the cavity, owing to the shadow cast by the tooth operated on. The *stronger* the light, the more decided the *shadow*. To obviate this, when operating on the upper front teeth, I have found a small piece of white muslin, folded so as to cover the tongue, but not protruded from the mouth, of decided service. The light striking upon the muslin, is reflected to the palatine surface of the teeth, and defines the margins of the cavity perfectly. If the

cavity is situated in the posterior approximal surface of a molar or bicuspid, a still smaller piece of muslin, held in place by the forefinger back of the tooth operated on, will reflect sufficient light to give a perfect view of the cavity.

To prevent abrasion of the cuticle at the corners of the mouth, it was my habit for years, as it has been that of many operators, to protect the skin, by napkins, from coming in contact with the shaft of the instrument. For the last three years, however, I have discontinued the practice, from a conviction that the maintenance of such a course would be subjecting my eyes to a most injurious influence.

Owing to the napkin being white, none of the rays of light that fall on it are *absorbed*, but all are *reflected* directly into the eye of the operator."

8.—*Case of Chorea cured by the extraction of eight stumps.*—The Dental News Letter for October, 1855, contains the report of a case of Chorea cured by the extraction of eight stumps by Dr. Billard. The author says, "after an examination of the case which was one of what is commonly called St. Vitus' dance, that he "found several stumps in both jaws, the gums entirely covering some of them, and on pressure of the same it caused her great pain, and pus exuding upon the slightest pressure.* * * I proceeded to give ether, and it took a double quantity to make her insensible to pain. I then took out eight stumps, and some small pieces of dead alveoli, which had caused a continuous irritation of the parts." Since that time the author states that the paroxysms grew less frequent, and now the patient, Miss L., enjoys her usual health.

9.—Dental News Letter, for October, 1855, contains the following, which we clip entire:

"The patient was a boy, in whose left cheek the phagedenic ulceration commenced during recovery after scarlet fever. The internal use of chlorate of potassa was first tried, and persisted with, in ten grain doses, for several days, the disease meanwhile being unchecked. A single free application of the concentrated acid was

then made to the part, and with the effect of completely arresting the morbid action. The induration of the surrounding part has since gradually subsided, and the sore is now almost healed. The case, althought not one of the most acute class, was yet of a character sufficiently alarming.—*Medical Times and Gazette.*

10.—*Anodyne Cement for Rendering Teeth Insensible to Pain.*—Mr. J. P. Clark, of London, with the object of rendering diseased teeth insensible to pain, previous to the operation of stopping them permanently with metal, or filing away the carious parts, recommends the application of a paste, composed of Canada balsam and slacked lime, which is to be inserted into the hollow tooth like a pill. Mr. Clark states, that this preparation affords immediate relief in all but chronic cases of inflammation. He says:

"If fresh pills be inserted as often as the old ones wear out, or are removed on the return of pain, in order, like an abscess, to allow the escape of matter or blood, and this practice continued, the teeth will become as insensible to touch as the soundest, and may then be permanently stopped, and otherwise treated in the usual way without the infliction of pain."—*Dublin Hospital Gazette.*

CHEMICAL.

11.—*Adipocire—Its Formation.*—Dr. Charles M. Wetherill read last winter an able memoir on this subject before the American Philosophical Society, which has been published in the Society's Transactions. The author has performed a number of experiments tending to determine the manner in which adipocire is formed and the materials which go to constitute it. The general belief among chemists since this substance was first carefully examined by Fourcroy, has been that it is formed out of all animal substances except hair, nails and bones. Lord Bacon affirms in one of his works, that nearly all flesh may be turned into a fatty substance by cutting it into pieces and putting it into a glass covered with parchment, then letting the glass stand six or seven hours in boiling water. In 1786-7 the Cemetiere des Innocens, at Paris, having been opened for the removal of the bodies to another grave yard,

Fourcroy had ample means of observing the circumstances under which adipocire is formed. He found an abundance of the substance, especially in the ditches where the slightly made coffins of the poorer classes had been piled one upon another; the trench being open for some time till it was filled with bodies when it was slightly covered with earth. On opening the trenches after some fifteen years the bodies were converted into adipocire; they were flattened by mutual pressure and had impressions on their surface of the grave clothes. George Smith Gibbes, a few years afterwards, observed that in Oxford, in the pits were thrown the remains of dissections, and at the bottom of which flowed a gentle current of water, large quantities of adipocire were formed; and placing a piece of beef in the river in a box pierced with holes, this substance also resulted. He states that nitric acid will affect the same changes in a few days. Bostock seemed to prove by some experiments which he instituted, that muscular fibre could be converted into fat by the action of nitric acid. Chevreul, on repeating his experiments, could not obtain fat from pure fibrine; but Von Bibra, as the result of many experiments, concluded that muscle, under certain circumstances, is changed to fat, and Blondeau arrived at the same conclusion from an examination of the cheese manufactured at Roquefort. The cheese when first made, contained 1,200 of its weight of fat, but after two months in dark, cool, damp cellars, the caseine was almost wholly converted into fat. A piece of beef, after two months in the cellar, surrounded with paste and slightly salted, was found changed, for the greater part, into a fatty body, presenting the greatest analogy to hog's lard.

The question is an interesting one in a physiological point of view. Some experiments recently performed by Liebig, Bopp, Keller and others, rendered possible the formation of fat from albumen, fibrin and caseine. It is certain that herbivorous animals possess more fat than is taken in their food, but it has generally been conceded that the excess comes from the sugar and other non-nitrogenized compounds. In like manner where organs in the animal body have undergone the fatty degeneration, the oil is supposed to be derived from other parts of the system, rather than formed in the part by a metamorphosis of the nitrogenous compounds.

Dr. Wetherill engaged in the study of adipocire with reference to this question. In his investigations he found that this substance seemed to be formed under opposite circumstances. In some graves

it was discovered, and in others contiguous to them decomposition had advanced to its full extent, leaving nothing but the skeleton. The preservation of some bodies seems, indeed, inexplicable in the present state of our knowledge, as, for example, the case of General Washington, who, having reposed in his tomb for more than forty years, was so perfectly preserved as to have been recognized from the resemblance of his portraits. When Dr. Wetherill engaged in the examination of adipocire he was inclined to the belief that it was a result of the blood-forming substances, but his experiments have brought him to a different conclusion, namely, that the higher members of the series of fatty acids do not result from the putrefaction of proteine compounds; and as corroborative of this view he mentions, that in all cases where adipocire has been found, the corpse was of a large and fat person. In grave-yards, he has remarked, if the proportion of flesh to fat be large, and especially if the nature of the ground be such as to prevent the escape of the decomposed matter, as by draining, no adipocire is formed, but the fat undergoes full decomposition. The microscope sustains his experiments, inasmuch as it fails to trace any arrangement of the fatty particles into fibres or rows, such as would here and there be seen if the fat came from muscles. The original fat of the body, Dr. Wetherell concludes, according to circumstances at burial, either partakes of a decomposition by which its elements escape, or else, losing its glycerine and most of its oleic acid, becomes gradually converted into adipocire. We do not suppose that his experiments settle the question, but to our mind they are nearly conclusive. *Western Journal.*

12.—*Ozone in Epidemics.*—[Translated from Review de Thérapeutique Medico-Chirurgicale, for the New Orleans Med. and Sur. Journal, by Mrs. M. E. V.]

M. Wolf, director of the observatory at Berne, announces in a letter addressed to the Academy of Sciences that, according to his personal observation, a rapid diminution of ozone in the air is (if not always, at least usually) followed by a considerable augmentation of mortality.

What is ozone? This is the question.

We answer with pleasure, for a new subject is in question, which is worthy attention under several aspects, and which recommends

itself equally to the chemist, meteorologist, and physician. Henceforth the study of the variations of this new principle enters into daily meteorological observations under the same claim as that of temperature, atmospheric pressure, etc.

Ozone is nothing else than oxygen itself; this gas which enters for twenty-one centiémes (·21) in the composition of the air we breathe. But is oxygen so different from that to which chemists are accustomed to give that name, that they have a great deal of trouble to recognise it under its disguise.

For instance, oxygen is without scent, as every one knows; ozone on the contrary has a strong odor. It is by its scent, indeed, that its presence became known to observers; its name being taken from the Greek, reminds you of this property. Its odor oftentimes partakes of those of chlorine, of phosphorus, and of burning sulphur mixed with air. It manifests itself in the discharges attendant on the turning the plate of an electrical machine, or when there is a peal of thunder.

But the new and permanent qualities which oxygen acquires in becoming ozone are not confined to this; we know, for instance, that ordinary oxygen only combines slowly with mercury at the usual temperature; ozone, on the contrary, combines rapidly with this metal. In a word, the oxydizing qualities of ozone are much more energetic than those of ordinary oxygen.

Van Marum was the first who found this remarkable substance. It was in 1785; having at his disposal the great apparatus belonging to the museum of Teyler, he excited sparks in a tube full of oxygen. A quarter of an hour afterwards, after 5,000 sparks, the oxygen had acquired a strong scent which he regarded as being very clearly that of electricity.

From 1785 to 1840, these remarkable experiments were completely lost sight of. In the course of the last year, M. de Schoenbein, professor of chemistry at Bale and inventor of the gun-cotton, decomposing water by means of an electrical battery, remarked that the production of hydrogen gas was accompanied by a very peculiar odor. He published a memoir on the subject. What was this new substance? Was it a simple element—was it an oxygenated product of azote or of hydrogen? The ingenious chemist left the question undecided, but he gave this odorous substance the name of *ozone*.

In 1851, two *savants* of Geneva, MM. Marignac and De la Rive, concluded after a series of experiments that ozone is nothing but

oxygen in the peculiar state of chemical activity given to it by electricity. Berzelius and M. Faraday believed equally that there is here, an isomeric or allotropic state, that is to say, a simple modification of the oxygen. Finally, in the same year, 1851, M. Schoenbein, who, on discussing this interesting question for the third time, agreed with MM. Marignac and La Rive.

Nevertheless, the majority of chemists admitted it hesitatingly. New experiments were necessary. Those made by MM. E. Frémy and Edmond Becquerel, in 1852, seemed to remove all doubts. They have shown, in confirmation of the experiments before mentioned, that electricity, acting on oxygen, develops new qualities in it; and these gentlemen have proposed changing the name of ozone into that of electrified oxygen (*Oyzéne électrisé.*)

Ozone then is nothing but a peculiar form of oxygen. Thus we are shown the changes that simple and compound substances experience in their most essential qualities from the force of exterior circumstances. The changes in oxygen that electricity causes in this case are comparable, in fact, to those produced by the solar rays on chlorine, whose affinities become much more energetic, and to those which heat develops in sulphur, phosphorus and carbon, whose colors, consistence, solubility and affinities they modify, and in many compound metallic oxyds, for instance, experience under its influence isomeric transformations. Thus, this collection of mysterious facts is of powerful interest and fully studied, will doubtlessly modify the classic ideas already much shaken as to the pretended number of simple substances which are thus found numerous by combination.

Once admit that by the agency of electric sparks oxygen can enter into a state of chemical activity, then we must ask, if this change which we produce in our laboratories, is not produced spontaneously in the air; the more so as we cannot doubt that the atmosphere incessantly agitated by storms, experiences these chemical changes we speak of. This is a matter, however, of which one does not soon acquire a certainty.

Since 1850, M. Schoenbein has proved that ozone decomposes the iodide of potassium, and he proved that a band of starched paper containing a small quantity of this salt, constitutes the most powerful, delicate reagent for discovering the presence of this new substance. A strip of paper prepared in this manner and exposed to the air, soon revealed, in changing from white, which was its orig-

inal color before the experiment, to a blue of more or less intensity, the presence of ozone. That ozone then exists naturally in the air, is a point demonstrated; but does it always exist in the same proportions? The contrary is evident. Of what importance is it then, to study its variations? To do this it was necessary to bring back the observations to a common mode of comparison; nothing proved more easy.

Observers first arranged an ozonometric scale by dividing into a certain number of parts or degrees, the chromatic space comprised between the white which answers to the absence of ozone and the most intense blue that ozone can produce, at its maximum on ozonoscopic paper, putting on simple iodine. Ten was the number of visions adopted, and, this done, they possessed an *ozonoscope* by means of which they could measure the daily variations of the atmospheric ozone, as they could by means of the thermometer and barometer measure the daily changes of the temperature, and atmospheric pressure.

Several philosophers, knowing the importance of this new branch of meteorological observation, have pursued it. MM. Bœckel at Strasburg, Simonin, Sen., at Nancy; Wolf, at Beane; Billard, at Corbigny; Schapter and Besluber, in Germany; Gailliard, in America, etc., are among these observers.

So that here is a substance, whose existence was not suspected a few years ago, and one which acts on us and on all animated nature. How is it possible to doubt as to the intensity of its action? How can one doubt but that considerable variations in the oxydizing power of respirable gas have a powerful influence on respiration, and, in consequence, on all the vital functions?

An American physician, M. E. S. Gailliard, finds a connection between ozone in atmospheric air and the appearance of intermittent fevers.

According to Dr. Bœckel, malaria always shows itself with the zero of the ozonoscope, and the same thing takes place when peludal fevers prevail.

According to M. Schoenbein, a considerable quantity of ozone was observed in the air of Berlin during the epidemic *Grippe* and during a medical constitution of the air predisposing to affections of the chest; and the reverse took place under the prevalence of the gastric constitutiou.

According to the same observer, ozone was completely wanting in the atmosphere of the same city during a cholera epidemic.

According to M. Bœckel, the same thing occurred at Strasburg. The appearance of the cholera coincided with the absence of ozone, and the ozone reappeared as the cholera decreased.

M. Billiard regards the diminution of ozone as the first cause of this terrible malady.

Finally, without going so far, M. Wolf, in the letter which occasioned this article, confirms, as to the city of Berne in which he resides, the observations made at Strasburg by Dr. Bœckel.

It appears likely to us that ozone has not only great physiological parts to perform, but it is necessary to employ it in explaining several physical and chemical phenomena, such for instance, as the productions of nitric acid in the atmosphere, and the disengagement of the odor which so often accompanies thunder.

(L'Ami des Sciences.) VICTOR MEUNIER.

[Addendum, from the *Gaz. Hebdon. de Med.* of May 11, 1855.]

Ozone and Cholera.—Having procured the daily list of deaths from cholera at Aarau, in Switzerland, from the 15th of August to the 14th of October, 1854, M. Wolf, director of the observatory at Berne, has classed the days in which no deaths occured—those in which there were one or two, and finally those in which there were three or more: "I have found," says he, "that the corresponding mean of the actions of ozone at Berne is—

For the days of the first class	. . .	6.48;
" second class	. . .	5.48;
" third class	. . .	4.58;

"I conclude from this," says M. Wolf, "that the cholera, to say the least, is very much favored by the diminution of ozone."—*L'Ami des Sciences.*

EDITORIAL DEPARTMENT.

Fatal Effects of Chloroform.—We publish in another part of the present No. of the Journal an article on the manner in which death is occasioned by the inhalation of chloroform; also an account of a death recently produced in Edinburgh, by the use of this anæsthetic agent, and in the last Boston Medical and Surgical Journal, we find the following account of the death of a lady, produced by the use of the same agent. There are some surgical operations, the magnitude and importance of which, may, we do not deny, justify the use of chloroform, but, the extraction of a tooth is too simple to warrant the employment of so powerful an agent, and we do not think a dentist should permit himself to be prevailed upon to administer it for this purpose under any circumstances, except by the advice and under the direction of the family physician of the patient.—Eds.

Death from Chloroform.—In our last number we noticed a case in which death occurred from the inhalation of chloroform recently in Edinburg. We regret to state that the same accident took place in this city on Saturday, Jan. 5th. We copy from the Boston Journal the following statement of the case, as prepared by Dr. Emery, who administered the chloroform.

"Between the hours of 1 and 2 o'clock on the 5th inst., I commenced to administer chloroform to Mrs. P. A. Morgan, at her request, for the purpose of removing some teeth. I commenced with a small quantity—should think from two to three drachms, on a sponge. She inhaled it without difficulty for a minute or two. Her pulse was not strong, but uniform. She then commenced to be excited, and said that I was going to extract her teeth, and she should know all about it. She said that Mrs. Paige (the lady who accompanied her) was getting the forceps to extract them with. I think about one minute had passed during this conversation and excitement. I then removed the sponge from her mouth, and in a few moments she became quiet, and satisfied that there had been no attempt made to remove her teeth. In a few moments I commenced the operation again with the same amount of chloroform. She inhaled it without difficulty about as long as she did before, and became so much excited that she got up out of the chair and insisted that I had extracted her teeth. She spit on the floor and looked to see if it was blood, and she insisted that some one was coming into the room whom she did not want to see. I sat her down in the chair again, and she then went into a spasm, closed her

teeth, and breathed with difficulty. I sprinkled water on her face, and the muscles relaxed, and I asked her to get up and we would place her on the lounge. She made an effort to rise, and with my assistance stood on her feet, and then instantly sank to the floor. With the assistance of Mrs. Paige, I placed her on the lounge, and then there was a rush of blood to the brain. I sprinkled water in her face again, but she showed no signs of being conscious. Mrs. Paige went for assistance, and I immediately commenced artificial respiration by insufflation, and kept it up until Dr. Stedman came in, which was but a few minutes." To this account by Dr. E., the Journal adds—

"As was stated in our paper yesterday, the inquest was held by Dr. C. H. Stedman, and the jury returned the verdict 'that the deceased came to her death from the effects of the chloroform, and that the chloroform was a pure article, and was given at the urgent solicitation of the deceased, and with all proper care and discretion.' They further say, 'from the testimony and opinion of medical experts in this case, the jury feel compelled to caution the public against the use of chloroform, as being a dangerous anæsthetic agent.

With this recommendation we entirely agree, and we have before urged, not the necessity of caution, (for caution seems to be of no avail in these cases,) but the abandonment of chloroform and concentrated chloric ether, as anæsthetic agents, in ordinary cases; the more especially since we have the original article used for producing insensibiltty to pain, sulphuric ether, which is efficient, cheap, and above all, safe. We are not aware that any case of death has occurred from the direct effect of the inhalation of ether, and although it is possible that such an event may take place, the article is beyond all question more safe than chloroform, the number of deaths from which now amounts, we fear, to thousands.

We cannot help thinking that the amount of chloroform used in this case was very large. It appears that from "two to three drachms" were first inhaled, and that the same amount was repeated. We believe that the most approved practice in England, is to pour a few drops (twenty minims, Druitt) on a handkerchief folded into a hollow cone, or into an apparatus specially designed for the purpose, and held at the distance of a few inches from the patient's nose. This is to be repeated occasionally until anæsthesia is produced; in many cases a single drachm is sufficient.

Silicious Gutta Percha Pencils for Removal of Discolorations from the Teeth.—Mr. Cyphers, a student of the Baltimore Dental College, has recently constructed a most useful and valuable instrument, for the removal of discolorations from the teeth. It consists of gutta percha and finely powdered Arkansas rock or quartz; the latter is largely incorporated in the

former, which is prepared in cylindrical pieces of about a quarter of an inch in diameter, and four or five inches in length. We have used it in a number of cases, and find it better adapted for the removal of discolorations from the teeth, than anything we have ever before employed. The practical value of the thing cannot fail to be appreciated by every dentist. Accompanying each box of these gutta percha sticks, are several pieces of tape coated with the same article, filled with very finely pulverized quartz. They are designed for acting on the approximal surfaces of the teeth, for the removal either of discolorations or removing file scratches from the surfaces of fillings in these localities.

Since writing the above we have received from a dentist of Baltimore, a communication endorsing the favorable opinion above expressed, with regard to the practical value of Mr. Cyphers' silicious gutta percha pencils. He says, he finds them so admirably adapted for cleansing and polishing the teeth and for finishing all kinds of plate work that he has no doubt their use, by the profession, will soon become universal. With a view of giving dentists an opportunity of trying his silicious gutta percha pencils and ribbons, Mr. Cyphers has placed a few of them in the hands of Dr. Blandy, put up very neatly in small parcels, ranging in price from 50 cents to one dollar.

Improved Blow-Pipe.—Mr. Flemming, a student of the Baltimore College of Dental Surgery, recently presented to the editors, a model of a blowpipe, invented by himself, and by means of which, a continuous blast may be kept up. It is constructed with a bellows and a valve to prevent the air from returning when the mouth is taken from the mouth-piece, while the compression of the sides of the bellows by means of two springs, keeps up the current of air from the nozzle of the instrument, until a fresh supply is furnished by the mouth. We shall publish a brief description of the instrument furnished by the ingenious inventor in our next issue, together with a cut, showing the manner of its construction. We would have published it in this, if the diagram had been prepared in time.

Franklin's Improved Cup for taking Impressions of the Lower Jaw.—The manufacturer, Mr. Franklin, dentist of Newark, N. J., presented to the senior editor, through Dr. Colburn of the same place, an improved cup for taking impressions of the inferior maxillary, in plaster of paris, which he has recently gotten up, and it is more admirably adapted to the purpose than anything of the kind we have ever seen. It is constructed with a concavity or cup on the upper as well as the lower side, with an opening between the two of a quarter of an inch in width, extending nearly from one

extremity to the other, except a piece of the mettle with which it is composed, half an inch wide, passes across it in the centre to strengthen the two sides of the cup. The one presented to the senior editor, is made of tin, plated with silver, and is altogether a very pretty affair.

In taking an impression with this cup, the under part is first filled with plaster, mixed in water until of a sufficient consistence to prevent it from running from the instrument; this done, the upper cup is filled immediately. The cup is now at once placed in the mouth and pressed gently down upon the alveolar ridge, until the latter becomes imbedded sufficiently in the plaster; that in the upper side, in the mean time, is pressed with the finger of the operator through the opening in the central part of the instrument, for the purpose of ensuring a perfectly accurate impression. The whole is kept in place, until the plaster has set, or congealed, sufficiently to enable the manipulator, to remove it without breaking—when the impression may be oiled and filled in the usual manner.

After the plaster put in the impression has hardened sufficiently, that in the upper part of the cup may be cut away, and the instrument removed. The plaster is now warmed until it reaches a temperature of about one hundred degrees, when it may be broken away from the model, which will be found to correspond exactly in shape with the alveolar border.

The cup here described, may, we believe, be obtained from Mr. Francis Arnold, instrument manufacturer, Baltimore.

Knowledge of the Teeth among the Ancients.—As a curious relic of ancient dental literature, we copy the following from Pliny's Natural History.—Eds.

It is a matter beyond doubt, that in young children the front teeth are produced at the seventh month, and, nearly always, those in the upper jaw first. These are shed in the seventh year, and are then replaced by others. Some infants are even born with teeth. Such was the case with Marius Curius, who, from this circumstance, received the name of Dentatus; and also with Cn. Papirius Carbo, both of them distinguished men. When this phenomenon happened in the case of a female, it was looked upon in the time of the kings, as an omen of some inauspicious event. At the birth of Valeria, under such circumstances as these, it was the answer of the soothsayers, that any city to which she might happen to be carried would be destroyed; she was sent to Suessa Pometia, at that time a very flourishing place, but the prediction was ultimately verified by its destruction. * * * Some persons are born with a continuous bone in their mouth, in the place of teeth; this was the case with the upper jaw of the son of Prusias, the king of Bithynia.

The teeth are the only parts of the body which resist the action of fire, and are not consumed along with the rest of it. Still, however, though they are able thus to resist flame, they become corroded by a morbid state of the saliva. The teeth are whitened by certain medicinal agents. They are worn down by use, and fail in some persons long before any other part of the body. They are necessary, not only for the mastication of the food, but for many other purposes. It is the office of the front teeth to regulate the voice and the speech; by a certain arrangement, they receive, as if in concert, the stroke communicated by the tongue, while by their structure in such regular order, and their size, they cut short, moderate, or soften the utterance of the words. When they are lost, the articulation becomes altogether confused and indistinct.

In addition to this, it is generally supposed that we may form prognostics from the teeth. The number of teeth allotted to all men, with the exception of the nation of the Turduli, is thirty-two; those persons who have a greater number, are thought to be destined to be long-lived. Women have fewer teeth than men. Those females who happen to have two canine teeth on the right side of the upper jaw, have promise of being the favorite of fortune, as was the case with Agrippina, the mother of Domitius Nero; when they are on the left side, it is just the contrary. It is the custom of most nations not to burn the bodies of children who die before they have cut their teeth.--*Vol. 2, book 7, chap. 15, p.* 153.

Anomalous Development and Osseous Union of three Teeth.—Dr. Colburn, dentist, of Newark, N. J., recently presented to the senior editor, for the Museum of the Baltimore College of Dental Surgery, a lower temporary incisor, or rather three incisors, having a complete osseous union throughout the entire length of two and to the crown of the third. Two of the teeth are very feebly developed, as well as the root of the third. The specimen, altogether, is not much larger than an ordinary temporary incisor. From between the crowns of two, the lingual surfaces of which are turned towards each other, the crown of the third emerges. The enamel of this last is somewhat eroded. The specimen presents a most singular example of anomalous development as well as osseous union, and the writer, in behalf of the faculty of the above institution, begs to thank Dr. C. for so interesting and valuable a contribution.

Crystalline or Sponge Gold.—It will be seen by a letter which we copy from a late No. of the New York Dental Recorder, that Messrs. A. J. Watts & Co., have recently made a most valuable and important improvement in the manufacture of this article. The senior editor has used some

of the improved preparation, and he has no hesitation in pronouncing it vastly superior to any thing of the kind ever before employed by him for filling teeth. There was one objection to all the preparations of crystalline or sponge gold which he had previously used, and that is, its liability to crumble while introducing it into the cavity of a tooth, so that more or less of it escaped into the mouth, and was lost. This, however, while it is softer and more easily consolidated, is so adhesive, that considerable effort is required to separate a particle from the general mass. It is more easily moulded to the various depressions and irregularities of the surface of the walls of a cavity, than any previous preparation of the kind which we have seen. The particles or crystals are also more easily united one to another, and the union is less likely to be affected by moisture. From the experience which the senior editor has had in the use of the improved preparation, he feels warranted in saying, that a more perfect filling can be put in with it, in many cases, than with the best of foil, provided it be kept absolutely free from moisture during the process of introducing it into the tooth and compacting it. As much skill, however, and care are necessary in filling a tooth with this as with gold in any other form. In short, when properly worked, it cannot fail to give the most entire satisfaction.

Cheiloplasty.—This operation of lip-making has been performed by Professor Eve, of Nashville, in a case of great difficulty. The patient was a stout healthy youth of good habits, aged 18 years. The upper lip had been destroyed by salivation. From the points of each commissure of the mouth upwards for about three-fourths of an inch, and across the base of the septum of the nose, including one of its wings, and a portion of its column, was a vacant space occupied only by the teeth and gums. A hard cicatrix defined the outline, closely attached to the alveolar and bony structures. This was exsected, and then two long incisions, about one inch apart, on each side, were made through the cheek, extending to near the ears. These were dissected up to make a new lip, and secured with three hare-lip pins and one suture in the mesial line. Stitches were placed in the cheeks, and the whole was further secured by adhesive strips, compresses and rollers. The operation was successful, presenting "a pretty fair upper lip;" and is the most extensive and difficult operation of the kind which has ever been performed, constituting a triumph of surgical skill highly creditable to the distinguished operator.—*Memphis Recor.*

What Next?—We see it stated in the papers that Mr. Charles Goodyear, Jun., now a resident of Paris, has recently obtained letters patent for constructing bases of artificial teeth consisting of a hard compound of caout-

chouc and gutta percha mixed with sulphur and then subjected to heat, forming a vulcanized compound of the two first articles. We presume the caoutchouc and gutta percha are first bleached white, and afterwards made of a gum-color by mixing with them suitable coloring matter. Whether the compound will resist for a length of time the action of the secretions of the mouth we are not informed. If it will do this, it may prove a valuable acquisition to the resources of the dental art, provided artificial teeth can be as lightly and securely mounted on a base of this sort as on a metallic plate. These are questions which we have not yet seen answered.

Justice at last to Dr. Beale.—The law's delay "has never been more unhappily illustrated than in the case of the unfortunate Dr. Beale. Party politics have interfered with the demands of justice. One governor could not pardon him on the eve of an election, lest it might influence the ballot box on that important occasion, and another could not liberate him until a second election had so completely destroyed the prospects of his party as to absolve him from the necessity of courting votes.

The whole history of this man's trial and incarceration, leaves an indelible blot upon the jurisprudence of Pennsylvania. He fell a sacrifice to the misguided justice of the chief city of the state. An incompetent jury pronounced him guilty on the testimony of a girl, by her own confession, delirious from ether. There was not the shadow of real evidence adduced by the prosecution, and the unhappy victim stands acquitted in the minds of all men of common sense and average justice of the atrocious charge brought against him. Never before was there so shameful a neglect of the rules of evidence, except, perhaps, in the High Court of Commission in the Assizes over which the notorious Jeffrey presided. That a man should be convicted of so grave a charge on the simple assertion of a woman, whose statement confesses to an intoxication, so thorough as not to be sensible to the most serious affront which could be offered her, and whose story abounded in absurd contradictions, sufficient entirely to have ruled out her testimony, on a question involving the smallest amount of property cognizable by the laws, is an astounding evidence of the facility with which juries are ruled by public opinion. This, perhaps, was to be expected, but that the judge should have permitted such testimony to be taken, that he should have allowed the jury to come to a decision without knowing whether the woman was still a virgin or not, whether any of the signs of violation were present, is a dereliction of duty upon which we will not trust ourselves to comment on. Then that two governors in succession could be found, so indifferent to the demands of justice, so careless of the sufferings of an innocent man and his troubled family, as to allow him to languish so long in confinement, is a painful example of magisterial inefficiency which we hope never to see followed. It cannot be pretended that any new light has

been thrown upon the question by this cruel delay. The governor, himself, in the most disreputable document which extends the pardon, acknowledges that he believes the prisoner innocent of the charge, on the ground of insufficient testimony adduced on the trial, a fact which he might have ascertained on the first day in which he assumed the chair of state, as fully as this late hour, when unmerited disgrace and undeserved suffering has bowed the hearts of the defendant and his family.

We have used the phrase "disreputable document," in speaking of the governor's pardon, with a full sense of the meaning of the words, and we need only call our reader's attention to the singular discrepancy in the two paragraphs of this remarkable paper quoted below, to justify our strong language. Though acknowledging the man's *innocence*, he has the impudence to read him a lecture as though he were guilty. Not willing to lose the political influence of the enemies of the persecuted man, he cants about "the moral reform of the prisoner," and panders in the most abject manner, to this "public sentiment," to which he considers "ample satisfaction has been rendered;" *ample satisfaction* for what? An innocent man has rendered ample satisfaction for a crime which their majesties, a fraction of the people, have seen fit to imagine. Our cheeks burn with shame, to be compelled thus openly to acknowledge the charge, so often urged against by the European enemies of republicanism, that in this country public opinion often becomes a despot, compared to which the Czar himself is a mild and powerless ruler. That a man in so high position, however, should thus shamelessly avow himself, so submissive a slave to this irresponsible power, fills us with horror and disgust.

It is true, he quotes these objectionable phrases as the opinion of the Board of Inspectors of the Philadelphia County Prison, but they are used as a part of the reason for the man's acquittal, linked together among the influential "whereases," which have induced the act of executive *clemency*.

We wish once more, to disclaim all personal feeling in this matter. When we were called upon a year ago to comment on the finding of the jury, we explicitly declared that we had no personal acquaintance with this unfortunate victim of public opinion. We renew that assertion now. We have never seen or spoken with Dr. Beale; but believing him, as we have ever believed him, altogether innocent of the crime laid to his charge, we have had the honesty to express our opinion in such language, as the atrocity of the persecution seemed to demand.

He had received communications from about one hundred and forty dentists and twenty-three physicians of this city and the country, stating their belief that testimony as to matters transpiring under the influence of ether is unsafe and unreliable; from a number of other physicians named, that they believed him innocent; from a number of the bar, and citizens of various states, including the names of governors, attorneys-general, etc., that they believed he was convicted on insufficient testimony; from a num-

ber of clergymen, that they believed him innocent; from the Mayor of Philadelphia, and fifty members of the Philadelphia city council; from members of the legislature, judges of the supreme court; editors of Philadelphia newspapers, and five thousand others citizens of Pennsylvania and New York, with five of the jury on the trial, all asking his pardon. After enumerating all these facts, the governor says:

"And whereas, the board of inspectors of the said Philadelphia county prison, (as appears by their communication on file in the office of the secretary of the commonwealth,) have unanimously recommended the pardon of the said Dr. Stephen T. Beale, because, in their opinion, the end contemplated by the law in the moral reform of the prisoner has been attained—because full and ample satisfaction has been rendered to public sentiment by the imprisonment he has already undergone—because his health is undoubtedly breaking down under the sufferings of body and mind which he has already endured, and because the destitute condition of his aged parents and bereaved and sorrowing wife and children imperatively demand the presence and support of their son, husband and father.

"And whereas, after a full and careful examination of the facts and evidence in the case, aided by the scientific discussion to which it has given rise, (without any intention to reflect upon the prosecutrix, who no doubt testified to what she believed did occur—nor to impugn the integrity of the learned judge who tried the case, nor the honesty of the jury who convicted the prisoner,) *I am now satisfied* that the defendant, Dr. Stephen T. Beale, is *not guilty* of the crime whereof he stands charged, and was convicted upon evidence unreliable in its character, and insufficient in amount.

"I do, therefore, in consideration of the premises, pardon the said Dr. Stephen T. Beale of the crime whereof he is convicted as aforesaid, and he is hereby fully pardoned accordingly."

Artificial Teeth Mounted in a Base of Gutta Percha.—It will be recollected by most of the readers of the Journal that Dr. A. Hill, of Norwalk, Conn., instituted a series of experiments with a view of ascertaining the practicability of using gutta percha as a base for artificial teeth, and that his efforts were so far crowned with success that he was enabled to employ it very advantageously, in many cases, for temporary sets. Soon after this announcement was made to the profession, Mr. Truman, of England, published a small treatise on the use of this article for the same purpose, and for the use of which, we believe, he obtained a patent. This treatise was reprinted some three or four years ago in the Journal, and we publish, in the present No., a letter from Mr. Slayton, dentist, of Indiana, who has recently succeeded in producing a very beautiful preparation of gutta percha for this purpose. It is so tinted as to resemble quite closely the color of the gums. Artificial teeth may be very securely mounted in a base

of this preparation, which for temporary purposes, we have no doubt, will answer a very excellent purpose. It is certainly more congenial to the mouth than a metallic plate, and if it were durable and not liable to become offensive, would undoubtedly be a desideratum in the prosthesis of the teeth. We saw one upper set of artificial teeth mounted in this preparation which had been worn some four or five months. These appeared to be still quite securely arranged, and we were assured they were easily kept clean by means of a common tooth brush, castile soap and water.

The practical value of this preparation will soon, we have no doubt, be ascertained, as Mr. Slayton has already instructed many members of the profession in the manner of using it, and at the same time supplying them with the article. We would be glad to ascertain the result of the experience of some of our friends, who are using it. We will gladly lay such information as may be furnished on the subject before our readers. The preparation in question is kept for sale by Messrs. Jones, White & McCurdy, of Philadelphia.

Destroyed by Fire.—We learn, with sincere regret, that among the losses occasioned by the late fire in Syracuse, N. Y., was the *New York College of Dental Surgery,* occupying the third and fourth stories of the Wick's Block, as well as the dental rooms in the second story of Professor Westcott. The entire Museum, embracing, as we are informed, many valuable preparations, imported from Paris, were consumed, together with the apparatus and chemicals of the laboratory, the fixtures and apparatus of the lecture rooms. An extensive mineralogical and geological cabinet, belonging to Prof. W., and placed in the lecture room, were, in part, we are glad to learn, got out of the building. The paper from which we obtained the above particulars is unable to inform us whether the losses, or any part of them, sustained by Prof. W., were covered by insurance. We trust that this was the case.

Dr. F. H. Badger's Method of Filling Cavities in Posterior Approximal Surfaces of Molar Teeth.—As this method, adopted some years since, of filling cavities in the posterior approximal surface of molar teeth when difficult of access, has recently been discussed by some of the members of the profession, it gives us pleasure to be able to present, in the present number of the Journal, a brief description of it furnished by Dr. Badger. As a most skillful and finished operator, Dr. B. has been known to most of the older members of the profession in the United States for more than a quarter of a century, and any thing from the pen of so old and eminent a practitioner, will, we are well assured, be read with pleasure. We would be glad if the doctor would continue to furnish contributions to our pages from the ample storehouse of his large experience.

Salivary Calculus.—Dr. Davis, of Baltimore, presented to the senior editor, a few weeks since, a concretion of salivary calculus, about one and a half inches long and about five-eighths in diameter, of a cylindrical shape, and as compact in its structure almost as ivory. It was taken from the parotid duct of a horse. We intend to have a portion of it analyzed, the result of which, we will give in a future number of the Journal.

The Physician.—Here is a tribute well deserved, to a profession to which society owes a vast debt:

"No class of men in the regular discharge of duty, incur danger more frequently than the honest physician. There is no type of malignant maladies with which he fails to become acquainted; no hospital so crowded with contagion that he dares not walk freely through its wards. His vocation is among the sick and dying; he is the familiar friend of those who are sinking under infectious disease; and he never shrinks from the horror of observing it under all its aspects. He must do so with equanimity; as he inhales the poisoned atmosphere, he must coolly reflect on the medicines which may mitigate the sufferings that he cannot remedy. Nay, after death has ensued, he must search with the dissecting knife for its hidden cause, if so by multiplying his own perils he may discover some alleviation for the afflictions of others. And why is this? Because the physician is indifferent to death? Because he is steeled and hardened against the fear of it? Because he despises or pretends to despise it? By no means. It is his especial business to value life; to cherish the least spark of animated existence. And the habit of caring for the lives of his fellow-men is far from leading him to an habitual indifference to his own. The physician shuns every danger but such as the glory of his profession commands him to defy."—*Boston Med. & Surg. Journ.*

Accidental Poisoning.—A correspondent (Dr. J. H. Blake, of North Auburn, Me.,) mentions a case of poisoning by arsenic, which occurred lately in his practice, the mineral forming an ingredient of the coloring matter used for staining paper. A child was taken sick after chewing a green pasteboard show-card. An active emetic was administered immediately, and the boy was well the next day. On examination, it was found that the card was painted, or enameled, with a preparation of arsenic.—*ib.*

Milk, an Article of Food, not a mere Beverage.—This has been determined legally the other day by the Court of Cassation in Paris, and its decision is in accordance with sound physiological principles. After this, the person who adulterates milk, no longer commits a simple contravention of the acts of police, with a penalty of 15 francs fine, and imprisonment of from 24 hours to 8 days; he now may be found guilty of a misdemeanor, and punished with a fine of 50 francs, and imprisonment of from three months to a year.—*Gazette des Hopitaux.*

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ORIGINAL COMMUNICATIONS.

ARTICLE I.

Chemistry of the Metals—Copper. By Professor R. N. Wright, A. M., M. D.

(Continued from page 358, of Vol. 5, New Series.)

It was designed to have published in the October number of the Dental Journal the present article, but circumstances rendered its preparation impossible; we trust, therefore, that our seeming neglect will be duly overlooked.

We stated at the conclusion of the last number, that we would commence the present article with an account of the process for the deposition of copper by means of galvanism; but thinking a modification of that plan better adapted to the arrangement we have adopted heretofore, we will proceed first to examine the compounds of copper, natural and artificial, closing with a description of the electrotype process.

First, then, we will take the compounds with oxygen, the following account of which is to be found in "Brande's Manual."

Copper and Oxygen—Dioxyd of Copper.—"There is only one salifiable oxyd of copper, which, therefore, is generally re-

garded as the *protoxyd;* but there is a *suboxyd* or *dioxyd,* (2 cu+O,) which occurs native, and which may be formed artificially, not by the direct oxydizement of copper, but by processes, in which oxygen is abstracted from the protoxyd. The following are the methods by which this suboxyd may be obtained: 1. By heating 5 parts of peroxyd with 4 of very finely divided metallic copper; or, according to Turner, by arranging thin copper plates, one above another, with interposed strata of the black oxyd, and exposing them to a red heat carefully protected from the air. 2. By boiling a solution of acetate of copper with sugar, by which the protoxyd of the acetate is reduced to the state of suboxyd, and separates in the form of a red powder. 3. By fusing dichloride of copper with carbonate of soda, and washing and drying the residue. 4. By fusing a mixture 100 parts of crystals of sulphate of copper with 57 of crystals of carbonate of soda; when the water is expelled, the mass is reduced to powder, mixed with 25 parts of copper filings, and exposed to a white heat for about twenty minutes; the residue is then pulverized, washed and dried: it is of a red color; the tint being improved by trituration and washing. This, which is Malagutti's, is the most economical and yields the best product. (Ann. de Ch. et Ph., liv, 216.) 5. *Hydrated* suboxyd of copper is precipitated in the form of a dingy orange-colored or brown powder, when a hot solution of subchloride of copper is decomposed by potassa; if dried in vacuo, it becomes reddish brown. 6. When sulphate of copper and protosulphate of iron are dissolved in water and precipitated by an alkali, dioxyd of copper and peroxyd of iron are thrown down: the former may be separated by digestion, out of the contact of air, in ammonia, which gives a colorless solution. (Levol, Ann. de Ch. et Ph., lxv, 320.)

"When this oxyd is intensely heated out of contact of air, it frequently happens that small octëdral crystals, as well as cubes, are formed in it; the same thing was observed by Chenevix, on exposing peroxyd or hydrate of copper to a violent heat in an open crucible, without addition; a semifused mass, resembling native red copper was obtained. (Phil. Trans., 1801.) The di-

lute acids resolve this oxyd into metallic copper and peroxyd; it dissolves in concentrated hydrochloric acid; it also dissolves in ammonia, as will presently be explained, it is not soluble in solutions of potassa or soda.

"This compound may be regarded as consisting of 1 atom of copper and 1 of protoxyd; or, of

				Chenevix.	Berzelius.
Copper, .	2	64	88.9	88.5	88.97
Oxygen, . .	1	8	11.1	11.5	11.03
Dioxyd of copper,	1	72	100.0	100.0	100.00

"Copper vessels, such as tea-urns, &c. and medals, are often superficially coated with this oxyd, or *bronzed;* it gives them an agreeable appearance, and prevents tarnish. For this purpose, two processes are resorted to: 1. The copper surface is cleaned, and then brushed over with peroxyd of iron (generally colcothar) made into a paste with water, or with a very dilute solution of acetate of copper, heat is then cautiously applied in a proper furnace or muffle, until it is found on brushing off the oxyd, that the surface beneath has acquired the proper hue. 2. Two parts of *verdigris* and 1 of sal ammoniac are dissolved in vinegar; the solution is boiled in a pipkin, skimmed and diluted with water, until it only tastes slightly of copper, and ceases to deposit a white precipitate; it is then poured into another pipkin or copper pan, and rapidly brought to boil, and the medal previously rendered bright, and *perfectly clean,* is dipped into the boiling solution, which may be most conveniently done, by placing it in a small perforated copper ladle, or wire colander, made for the purpose; the surface of the medal becomes at first black or dark-blue, and then (in about 5 minutes) acquires the desired brown tint; it must then be instantly withdrawn, (otherwise it changes color,) and washed in a stream of water, so as perfectly to remove all soluble matters from its surface; and lastly, very carefully wiped and dried. The medal is generally perfected by afterwards giving it one gentle pinch between the dies, in the coining-press. When there are many medals, each must be done separately, as they must not be al-

lowed to touch each other, and care should be taken to rest them upon as few points of contact as possible. The bronzing liquid also, must not be suffered to concentrate by evaporation, but must be diluted if necessary, so as to keep it in a proper state, and especially to avoid all appearance of a white precipitation in it. It is better that the process should be too slowly, than too rapidly effected. Medals and voltatypes, may also be bronzed by covering their surface with plumbago, heating them to dull redness, and then brushing the surface until it acquires the desired tint."

The next oxyd we shall consider is now generally acknowledged as the *principal* salifiable base in the formation of copper salts, (formerly deutoxyd, now) protoxyd of copper ($Cu+O$.)

This oxyd is invariably formed when copper is heated in the air, and peals off as the metal cools, in the form of dark iodine colored scales. The most expeditious method of obtaining it, is to heat the copper to a cherry red, and plunge it, as soon as withdrawn from the furnace into cold water, the rapid contraction of the metal occasions the desquamation of the oxyd in considerable quantity, and when cold, we have but to reduce it to fine powder, expose it to a red heat, agitating it at the same time, so that there shall be free atmospheric contact, and we obtain the desired result.

With reference to this oxyd, Brande has the following, p. 814.

"*Protoxyd of copper* is black, or bluish or brownish-black: its specific gravity is 6.4. Before the blow-pipe, it fuses when intensely heated, by the tip of the flame, upon charcoal: by the interior of the flame, it readily affords a globule of metal. It is very readily decomposed at a dull red heat, by hydrogen and by carbon, and consequently also by organic substances; hence its use in organic analysis; it is very hygrometric, and for this reason, if weighed while hot, it generally augments in weight after cooling, in consequence of the absorption of aërial moisture. It is insoluble in water, but it dissolves in, or combines with, the greater number of the acids, and is the basis of all the common salts of copper. When alkalies are dropped into its solutions, they throw it down, as a bulky blue hydrate, which, how-

ever, is not permanent at a boiling heat, but becomes black and anhydrous.

"This oxyd of copper is not soluble in the liquid fixed alkalies, but when carbonate of potassa, or of soda are fused with it, it expels carbonic acid, and combines to form a blue or green compound. It communicates a green, and sometimes a blue tint to vitreous compounds; and Sir H. Davy has shown that it is the basis of certain colors used by the ancients, which had been supposed to contain cobalt. (Phil. Trans., 1815.) It consists of,

				Proust.	Berzelius.	Gay Lussac.
Copper,	1	32	80	80	80.13	80.28
Oxygen,	1	8	20	20	19.87	19.72
	1	40	100	100	100.00	100.00

This oxyd is sometimes considered as a *deutoxyde*, ($Cu+O_2$,) and the *dioxyd*, as a *protoxyd;* in this case, 64 becomes the equivalent of copper. Gmelin and Berzelius, however, regard the salifiable oxyd as the protoxyd, or as constituted of 1 atom of copper, and 1 atom of oxygen. Turner also has adopted this view, and urges in favor of it, 1st, That the general characters of a suboxyd belong to the red oxyd. 2d, That the equivalent of copper, deduced from its specific heat (p. 163) is, 32; and 3d, that the salts of black oxyd of copper are isomorphous, with those of the protoxyd of iron; which gives a strong presumption, that those oxyds possess the same atomic constitution. To these arguments it may be added, that the electro-chemical equivalent of copper appears to be 32."

The following alkaline precipitate, commonly used as a coloring ingredient in paper staining, &c., is thus spoken of by the author above quoted:

"*Hydrated Protoxyd of Copper*, as thrown down from a solution of sulphate of copper by potassa or soda, is at first of an agreeable blue color, but this soon changes to green, especially if it be dried; when it is used as a pigment or color for paper staining, it is rendered more permanent by mixing it with glue or size, and chalk or alumina are sometimes added: it, however,

soon acquires a green tinge. Dumas gives the following process for preparing a blue color with this hydrate: 6 parts of sulphate of copper, and 3 parts of chloride of calcium, are dissolved in separate portions of water; the solutions are then mixed, and when the sulphate of lime has subsided, the solution of chloride of copper is poured off and mixed with cream of lime, containing $1\frac{1}{2}$ parts of quick lime; the mixture is well agitated, and the greenish precipitate which falls, and which is an oxychloride of copper, being well drained, is ground up with a fourth part of lime, and a fourth part of potash of commerce, so as to form a mixture of proper consistency. When this paste is put into bottles, a fourth part of sal ammoniac, and half a part of sulphate of copper, are added to improve the color, which, however, cannot be depended on, as it is apt to become green when dry, so that it is generally sold in the form of paste, to avoid the risk of desiccation."

There is another oxyd of copper, abounding in the vicinity of Cornwall, Great Britain, having a specific gravity between 5 and 6, with a reddish or drab color, commonly called "tile ore," which occurs massive, or in six, eight or twelve sided crystals, but not sufficiently important to demand especial notice.

Sulphuret of Copper.—The first of these compounds to which we would direct attention, is that which is most abundant and most used in the manufacture of copper for commercial purposes; viz. the ferruginous sulphuret, or copper pyrites, as it is commonly called.

We are probably speaking within bounds, in saying, that more than half the copper of commerce is procured from this combination; some specimens are remarkably beautiful, being highly iridescent; indeed, so singularly beautiful is the play of colors in some specimens that the term "pavonine"* sulphuret has been used. The usual form in which it appears is that of tetraëdral crystals, and in most specimens, we find nothing but iron, copper and sulphur, but occasionally, there is a small quantity of lead, and a minute portion of arsenic.

Sulphuret of Copper.—Cu+s. When sulphuretted hydrogen

*From a fancied resemblance to the gorgeous colors of the peacock.

gas is passed through a solution of some salt of protoxyd of copper, a dense precipitate is deposited, which, upon examination, turns out to be a sulphuret of copper, having colors varying with its condition of dryness, being brown when first deposited, gradually changing to black, and greenish-black as it dries. Its chemical constitution is as follows:

Copper, . . .	1 atom	32
Sulphur, . . .	1 "	16
Protosulphuret of copper,	1 "	48

Disulphuret of Copper.—2 Cu+s. This compound is produced whenever a mixture of copper turnings and sulphur are heated together, until the sulphur melts; as soon as this happens the action between the substances becomes quite violent; the copper assuming a bright red heat, and combination occurring with the formation of a black brittle mass, found upon examination to be a disulphuret of copper, and to be constituted as follows:

Copper, . . .	2	64
Sulphur, . . .	1	16
Disulphuret of copper,	1	80

Combinations of Copper and Chlorine.—There are two of these occurring when chlorine and copper come into contact; viz. the *dicloride* and the *potochloride*, which are thus described by Brande.

*"*Dichloride of Copper*—(2 Cu+Cl)—was first described by Boyle in 1666, under the name of *rosin of copper.* It was afterwards examined by Proust, who called it white muriate of copper. (Ann. de Chimie, xxviii, 218.) It may be obtained by exposing *copper filings* to the action of chlorine not in excess; or by evaporating the solution of dioxyd in *hydrochloric acid*, and heating the residue in a vessel, with a very small orifice; or by heating the *protochloride* in the same way. It is also the residue of the distillation of a mixture of 2 parts of *corrosive sublimate*, and 1 of copper filings. When *protochloride of tin* is added to any soluble salts of copper, or when *copper filings*

* Brande, p. 815.

and the *protoxyd* are digested in hydrochloric acid, this *dichloride* is also formed. It is insoluble in water, but soluble in hydrochloric acid, from which potassa throws down the *hydrated dioxyd.* When water is added to its *hydrochloric solution*, it is thrown down in the form of a white granular hydrate: its color varies, being generally dark brown; but if fused and slowly cooled, it is yellow, translucent and crystalline: it must be preserved out of contact of air. It consists of

			J. Davy.
Copper, . .	2	64	64
Chlorine, . .	1	36	36
Dichloride of copper,	1	100	100

With reference to the compound of copper and chlorine commonly known as Brunswick green, the same author has the following:

"*Hydrated Dichloride of Copper—Submuriate of Copper.*—When moistened dichloride of copper is exposed to air, it acquires a greenish-white color, and becomes converted into a compound of chloride and oxyd of copper, which has been termed, *submuriate of copper*, or *Brunswick green;* the same compound may be formed by adding *hydrated oxyd of copper* to a solution of the chloride, or by exposing to the atmosphere slips of copper, partially immersed in *hydrochloric acid.* This compound consists, according to John Davy, of 4 atoms of *protoxyd of copper*, 1 of *hydrochloric acid* and 3 of water. Protochloride (Cu+Cl) is obtained, under ordinary circumstances, by throwing copper into *hydrochloric acid*; the copper is dissolved, and the residue must be obtained by evaporation to dryness at a moderate heat. Another method has been proposed by Dumas, which in substance is as follows: he proposes to decompose *sulphate of copper* by mixing with it *chloride of calcium*, he then removes sulphate of lime by filtration, and subsequently evaporates the fluid to the consistence of syrup and obtains the chloride by solution in alcohol.

When this compound is perfectly formed and is free from water, it has a yellowish-brown appearance, but becomes blue

by exposure to the atmosphere. When a solution of potassa is added in moderate quantity, a green compound is deposited, which is most probably a *subchloride;* heated to redness, it becomes converted into *dichloride*, by losing a portion of its chlorine; and whenever allowed to come in contact with *ammonia*, in the form of gas, will take up, it is said, 56 per cent., and become changed into a bluish colored substance and quite pulverulent; this chloride has the following chemical constitution:

Copper, . . .	1	32
Chlorine, . . .	1	36
Protochloride of copper,	1	68

There is another compound belonging to this class, and found native in some districts, the *atacamite* of mineralogists; we will not attempt to describe it, but merely give below the result of Dumas' analysis, according to which it consists of

Protoxyd of copper,	3	120	53.5
Protochloride "	1	68	39.5
Water, . .	4	36	16.0
	1	224	100.0

Cyanurets of Copper.—"*Hydrocyanic acid and hydrocyanate of potassa, throw down a white curdy precipitate in the solution of *dichloride of copper.* A similar compound is obtained by the action of *dilute hydrocyanic acid*, upon *hydrated dioxyd of copper*, it is soluble in ammonia and the solution is colorless; it is also soluble in *hydrochloric acid*, and precipitated by dilution and by potassa; it combines with other metallic cyanurets, forming a class of *cupro-cyanurets.* When *hydrated oxyd* or *carbonate of copper* is digested in dilute hydrocyanic acid, a yellow powder is formed, insoluble in water, soluble in *hydrochloric acid* and again precipitable by dilution."

Ferrocyanuret of Copper—may be formed by adding ferrocyanuret of potassium in solution, to a solution of one of the soluble salts of copper; it falls to the bottom of the glass, in the shape of reddish or chocolate colored gelatinous precipitate.

* Brande, (Eng. Ed.,) p. 825.

The reaction in this instance is exceedingly prompt, and a very small quantity of copper will be revealed, thus making ferro-cyanuret of potassium useful as a test for the presence of copper in certain conditions.

Fluoride of Copper.—The mixture of *hydrofluoric acid* and *hydrated dioxyd of copper*, gives a fusible compound, having a dark color while hot, but changing to red as refrigeration progresses; the process of evaporation being conducted so that the air cannot obtain access to it.

The Sub and Protoiodides of Copper have not been sufficiently examined to render an account of them in this place, either interesting or useful.

Sulphate of Copper.—There are many processes by which this compound may be formed, but the mention of one or two will be sufficient for our purpose; when copper, in contact with atmospheric air, is exposed to the action of sulphuric acid, to which a small quantity of water has been added, the salt is formed in abundance, it is also formed when a similar mixture is exposed to the action of heat, but perhaps the most common method of obtaining it is to expose the roasted sulphuret to the air and moisture, here it is formed abundantly, though for any except the most ordinary purposes, as prepared in this way, it is wholly unfit, containing a considerable per centage of impurities.

When pure, sulphate of copper presents a most beautiful example of crystallization; its crystals are rhomboidal and have a most beautiful blue color, they almost entirely resist the action of the atmosphere, being (when well formed) but slightly efflorescent. Under the action of heat at about 400° Fahrenheit, it crumbles down into a white powder, but if this be allowed to reabsorb moisture by exposure to the air, it will speedily regain its blue color; a continued red heat will wholly decompose it, evolving *anhydrous* sulphuric acid, while the oxyd of copper remains.

*"Sulphate of copper is much used in the arts, as a source of several blue and green colors. It is also employed by dyers

* Brande, (Eng. Ed.) p. 822.

and calico printers, and is an ingredient in some kinds of writing ink. It has also been used to prevent smut in corn, by steeping the grain in a dilute solution of the salt; (Quart. Jour. xvi, 156,) and minute quantities of it are occasionally added to bread, (in Paris especially,) to improve its color and quality. (Archives Gén. de Médecine, xxi, 145.) In medicine it is resorted to as a powerful emetic; and in very minute doses, as a tonic. It is also a valuable external application as an astringent, or when undiluted, as a styptic and caustic. It may be employed to prevent dry rot, by steeping timber or planks in its solution, and it is a powerful preservative of animal substances, which, when imbued with it and dried, remain unaltered. The waters of copper mines, often hold it in solution, and, when decomposed by immersing in them pieces of *iron*, yield precipitated metallic copper, (copper of cementation.) The precipitation of metallic copper during the electro-chemical-decomposition, of an aqueous solution of this salt, is now applied very extensively and successfully to the production of duplicates of medals, bank note plates," &c.

Anhydrous sulphate contains:

				Berzelius.
Oxyd of copper, . .	1	40	50	50.9
Sulphuric acid. . .	1	40	50	49.1
Anhydrous sulphate of copper,	1	80	100	100.0

The common rhomboidal crystals contain:

				Proust.	Berzelius.
Oxyd of copper, .	1	40	32	32	32.13
Sulphuric acid, .	1	40	32	32	31.57
Water, . . .	5	45	36	35	36.30
Crystals of sulphate of copper,	1	125	100	100	100.00

Nitrate of Copper.—Copper is very oxydizable in nitric acid, accordingly if the diluted acid be poured upon fragments of copper, brisk action immediately commences, the oxyd of copper is formed at the expense of a portion of the acid, evolving the deutoxyd of nitrogen, the undecomposed acid uniting with the oxyd and forming a deep blue solution, which contains the *ni-*

trate of copper; this may now be obtained in prismatic crystals, either by spontaneous or artificial evaporation. It is hard to keep in a crystalline form, from the fact that it contains a large amount of water, it is very soluble in water, and will also dissolve freely in alcohol, imparting to the flame of burning alcohol, a rich green tint, a similar tint is also imparted to the blowpipe flame. Sprinkled with water and wrapped in tin-foil, violent action immediately commences, attended with considerable heat and sometimes also with light, the nitric acid at the same time being decomposed, with the copious evolution of hyponitric acid.

A salt which detonates slightly on the application of heat, is formed when ammonia is added in excess to the solution of nitrate of copper; the first addition simply throws down the hydrated oxyd, an additional quantity will dissolve this, giving us the crystallizable solution in question, *ammonio-nitrate of copper.*

Nitrate of copper is constituted as follows:

Oxyd of copper,	1	40	42.6
Nitric acid, .	1	54	57.4
Nitrate of copper,	1	94	100.0

Subacetate of Copper—Common Verdigris.—This substance is abundantly formed by exposing plates of copper to the action of acetic acid, they quickly become corroded and the deposit is from time to time removed; a more common method practiced now is to alternate pieces of woolen cloth and plates of copper, the former saturated with acetic acid; as the plates become covered with acetate, the deposit is removed.

This salt consists of,

Oxyd of copper, .	2	80	43.24
Acetic acid, .	1	51	27.57
Water, . .	6	54	29.19
Sub-acetate of copper,	1	185	100.00

Acetate of Copper, Crystallized Verdigris.—This salt seems to have been known from a very remote period, and is formed

by dissolving the verdigris of commerce in acetic acid and crystallizing; this process is carried on slowly, and most commonly by suspending in the solution small pieces of sticks, straws, &c. The crystals are oblique and rhombic, having a blue-green color, which will scarcely dissolve in alcohol, but readily in 5 or 6 parts of water; if ignited with combustibles a green tinge is imparted to the flame.

This salt consists of:

Oxyd of copper,	1	40	39.2
Acetic acid,	1	51	49.9
Water, .	1	9	10.9
Acetate of copper,	1	100	100.0

Carbonate of Copper.—When the solutions of carbonated fixed alkalies are added to hot copper solutions, a massive hydrate is the result, which has a green color and is sold in the shops under the title of *green verditer* and used as a pigment. Copper sulphate in solution precipitated by carbonate of potash, yields a similar result of a blue color, also used as a pigment, and called blue verditer. The green carbonate of copper occurs abundantly native; and is known to mineralogists as *malachite*, it is rarely found crystallized, but is generally a very beautiful mineral.

Chloride of Copper—containing one equivalent of each of its constituents, is formed by passing chlorine gas, through a mixture of water and oxyd of copper, it is not important.

Citrate of Copper.—*Citrate* acid added to a solution of either sulphate or nitrate of copper, yields a pale blue citrate of copper, which is also unimportant.

Deposition of Copper by Galvanism—Preparation of Moulds. *"20. I can very reasonably conclude that the amateur will commence his experiments on the smaller works of art; and, as a knowledge of the mode of manipulation to copy these will, with a little practical experience, easily pave the way towards accomplishing greater things, I shall dwell principally on the art of

* Walker's Electrotype Manipulator.

copying medals, medallions, seals, &c., taking the reader with me through the entire process.

"21. There are many materials fitted for forming moulds; of these—*fusible metal*, *wax*, *stearine*, *gutta percha*, and a composition whose base is *spermaceti*, are mostly used. The first is applicable to all medals of ordinary size—the others to plaster medallions and larger medals.

"22. *Fusible Metal.*—This is an alloy, consisting of bismuth, tin, and lead; it melts at a low temperature—a few degrees below that of boiling water; and has been used as a philosophical toy, in the form of spoons, which melt in hot tea. For the latter purpose, it generally contains a small portion of mercury. Since the discovery of electrotype, it has been prepared for that process without mercury.

"23. The proportion of the different ingredients in a pound of this alloy is:

	oz.
Bismuth, . . .	8
Tin, ...	3
Lead, ...	5
	16 = 1 lb.

These should be melted together in a *clean* iron ladle, taking care to keep it on the fire no longer than is necessary to produce the complete liquefaction of the several ingredients. When melted, pour the metal on a stone or marble slab in drops. Then, after having *rubbed the ladle clean* with coarse paper, return the pieces of metal, re-melt them, and pour them out in drops as before. A third melting will insure the ingredients being well mixed. To retain the metal in a fit condition for use, the ladle must be frequently rubbed clean; and must always be removed from the fire *as soon* as its contents are melted. The former insures a bright surface to the mould; the latter preserves the alloy from waste by oxydation.

"24. *To make a Mould in Fusible Metal.*—Melt some in the iron ladle, and pour it on a slab; then, from the height of two or three inches, drop on it the medal to be copied, taking care

that the medal is COLD. In a few *seconds* the metal will be solid, and may be placed to cool; when it is cold, either with or without a few slight taps, the two will separate: and, if proper care has been taken, an *exceedingly sharp* mould will be obtained. The novice must not, however, be disheartened if his first attempts to obtain good moulds fail: for there are so many little accidents which may happen, that the most practiced manipulator may have to repeat his attempts. A slight shake of the hand may drop the medal irregularly; too much sunk, for instance, on one side. A film of oxyd may rest on a portion of the surface of the melted metal, and render the corresponding portion of the cast *dull.* Dull looking moulds must always be rejected; for so minutely correct is the process of electrotype, that the dullness of the mould will be transferred to *every* copy made from it. Even if an original medal be incautiously handled, the slight trace of a finger-mark will be transferred to the mould; and thence to the electrotype copies.

"25. The fusible metal will not always pour into a *round* mass, to receive the medal: unless the slab is perfectly level, it runs into a stream. This is a great inconvenience, but may be remedied by having a shallow cavity (saucer fashion) made in the marble; or by using any article of *earthenware*, which the kitchen or the laboratory may furnish, suited to the purpose. I have been in the habit of using the brown stoneware saucers, in which blacking is sold; and in them have produced some of the best moulds. They are to be inverted, and the metal is to be poured on them.

"26. *Clichée Moulds.*—The following is the mode adopted on the continent for obtaining the beautiful cast of the French medals, which are so much admired. These casts are in a fusible alloy, containing *antimony*, as well as the other ingredients (§ 23.) The composition is:*

Bismuth, ...	8 parts.
Tin, . . , . . .	4
Lead, ...	5
Antimony, ...	1

* Vide Proceed. Elec. Soc. part ii, p. 90, Aug. 17, 1841.

The metal should be repeatedly melted and poured into drops, until they are well mixed.

"27. A block of wood is then turned into a shape similar to that of a button-die, into one end of which is worked a cavity, the size of the medal to be copied, and *not quite so deep* as its thickness; in this cavity the medal is placed; should it not fit tightly, a circle of paper is pressed in with it; the medal, being thus firmly mounted, is to be copied in the following manner:

"28. A sheet of smooth cartridge-paper is fixed, by drawing-pins or otherwise, within side a box having sides about four inches high, which slope inwards in order to prevent the metal from being scattered away; the part to be used is very slightly oiled with a single drop of oil; on this is poured some of the prepared alloy, which should be removed from the fire as soon as melted (§ 23.) The metal is then stirred together with cards until it assumes a pasty appearance, and is on the eve of crystallizing; if, at this stage, the surface should appear defaced with dross, one of the cards must be passed over it lightly and speedily; should no dross appear, this part of the process may be omitted. The die containing the medal must then be held firmly in the right hand, and be struck gently and steadily upon the solidifying metal. Should an assistant be in hand to aid in this, it will be as well; for sometimes during the brief interim, while the card is being exchanged for the die, the exact moment is lost, and the mould is imperfect. When one stirs the metal, and the other is prepared with the die, the operation can be timed to a nicety. When an assistant is not at hand, the die should be placed within reach of the right hand, with the medal downwards. A little ingenuity will readily suggest the construction of a press, by which this part of the process could be accomplished. Large medals are moulded without the die, by dropping them in a sidelong direction upon the solidifying metal.

"29. The beauty and perfection of moulds thus obtained will amply repay the trouble of producing them—though I am not quite justified in using the word "trouble"—for by this mode, with ordinary care, two out of every three casts are perfect;

besides, therefore, the economy of time, the saving in the reduced oxydization of metal is thus of no inconsiderable importance.

"30. This method of producing moulds is not confined to obtaining them from medals, which melt at a *high* temperature; they may be obtained from the common *soft*, *white* metal, with little danger of damaging the original. They may also be obtained from the metallic casts, which are extant, of the French medals of Andrieu, &c. Moreover, if the fusible mould itself be cut round and fitted into the block in place of the medal, it may be employed as a die; and casts, *perfect* casts, equal in respect to fidelity, and similar to the original medal, may be obtained.

"31. Having obtained a mould, varnish the back and edge—and also a portion of the front, when the surface of the mould around the impression is larger than necessary. The best varnish is good sealingwax, dissolved in spirit of wine; but for immersion in the cyanide solutions to be described hereafter (§ 95,) wax, or, which is better, pitch must be used. It will now be ready for use, and it is to be attached to a copper wire. The end of this wire must be *quite clean;* the wire is placed across the flame of the candle, with the clean end beyond the flame; it is to be touched with a piece of rosin, and pressed on the edge of the mould. The mould will instantly melt to receive it, and in a few seconds it will be cold and firmly fixed. The moulds should be wrapped in paper, if they are not intended for immediate use.

"51. *Single-cell Apparatus.*—The annexed wood-cut (Fig. 3) represents the single-cell apparatus in its complete form. z is a rod of amalgamated zinc, m the mould, w the wire joining them, c the copper solution, p a tube of porous earthenware, containing a solution of acid and

Fig. 3.

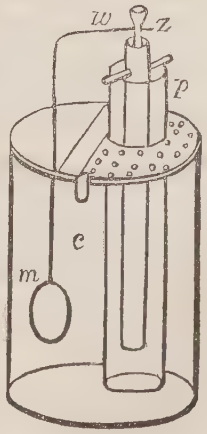
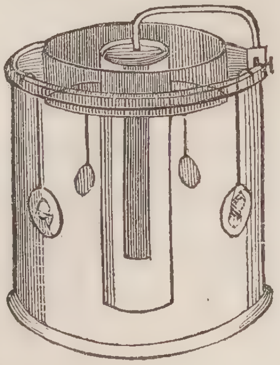


Fig. 4.



water. To put this in action, pour in the copper solution, fill the tube with the acid water, and place it as shown in the figure. *Last* (§ 75) of all, put in the bent wire, having the zinc at one end and the mould at the other. Another form of this apparatus is here given (Fig. 4.) The zinc is connected by a wire and binding screws with a metal rim; and on the latter can be hung several moulds, as in the drawing. Things are much more likely to go on well when several moulds, as thus, are operated on, than when only one is introduced. The reason will be manifest hereafter.

"52. The following precautions must be observed in using this apparatus: The copper solution must be kept saturated, or nearly so; this is effected by keeping the shelf well furnished with crystals. The mould must not be too small in proportion to the size of the zinc. The concentrated part of the solution must not be allowed to remain at the bottom. In the latter case, the copy will be irregular in thickness—in the former, the metal may be a compact brittle mass; or may be deposited in a dull red, a violet, or a black powder. The nature of these several depositions will be elsewhere alluded to (§ 62, &c.;) so will also the relative proportions of the zinc, &c. (§ 78.)

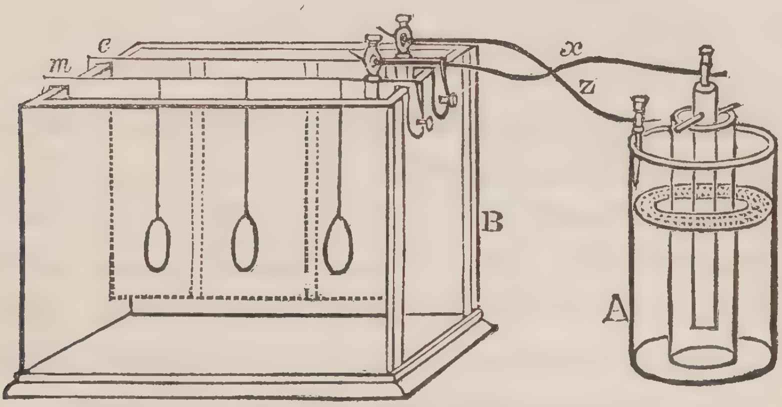
"56. *Battery Apparatus.*—A valuable improvement was devised in Russia, by Professor Jacobi,* and in England by a member of the Electrical Society, Mr. Mason.† It consists in using a decomposition cell, analogous to that already described (§ 11.) The constant voltaic pair (§ 17,) of copper and zinc is used as the generating cell. To the end of the wire attached to the copper is fastened a *plate of copper:* to the end of the wire attached to the zinc is affixed *the mould.* The sheet of copper and the mould are placed face to face in the decomposition cell. This arrangement will be better understood from the annexed figure. A, is a cell of Daniell's battery (§§ 17, 50;) B, the decomposition cell, filled with the dilute acid solution of sulphate of copper; *c*, the sheet of copper to furnish a supply; *m*, the moulds to receive the deposit. To charge this, pour in

*Vide Jacobi's Galvano-Plastic.

†Vide Proceedings of the Electrical Society, April, 1840, p. 203.

the several solutions: hang a piece of copper on the brass rod *c;* connect this rod with the copper of the generating cell by the wire *z;* and the other rod *m*, with the zinc, by the wire *x;* *then*, and not *till* then (§ 51,) hang the moulds on the rod *m.*

Fig. 6.



"57. *Solutions.*—The solution used in this decomposition cell or depositing trough, greatly depends on the battery or power employed; with a cell of Daniell's constant battery, a solution of about 2 sulphate of copper by measure, and 1 acid water (1 acid + 9 water,) is undoubtedly the best. When less power is employed, a little acid in addition is found to be advantageous.

"Professor Von Kobell, instead of mixing acid water with the saturated solution of sulphate of copper, adds solutions of Glauber's salt, or of potash alum, or of nitrate of potash; by which means he obtains deposits of very malleable copper. Glauber's salt appears to be the best; it renders the solution more conductible, and is not itself decomposed by such feeble currents, as are here in use; while its solution will take up as much sulphate of copper as common water does. Two of saturated solution of sulphate of copper, and one of sulphate of copper in solution of Glauber's salt, are stated to be good proportions.

"To the ordinary solution of sulphate of copper, the Messrs. Elkintons add caustic potash or soda in small quantities, until the precipitate is no longer redissolved by the solution, and they thus obtain a solution for the precipitating trough which gives up a greater quantity of copper for a given battery action, and gives it up also in less space of time."

ARTICLE II.

On Dental Deformities. By J. L. LEVISON.*

[Continued from page 531, of Vol. 5, New Series.]

AMONG the many topics which might be discussed under the *generic* title "of dental deformities," there is one which seems not altogether unworthy the attention of your readers.

If we examine the mouth of any one who has had a partial loss of teeth, either from disease in them, or from an accident, we shall observe a certain order in the phenomena, more or less defined, in the comparative duration of the process.

If, for instance, the upper front teeth are extracted or knocked out, the corresponding incisors in the lower, will, after some length of time, present not only the whole of their crowns, but also some considerable portion of their respective fangs. And among the fallacies which have been propounded, as explanatory of the fact, it has been assumed by some superficial students, that the lower teeth, under such circumstances, continue to grow, as nature equally disliked a space, as much as she is presumed to be outraged by a vacuum! Others have made the learned attempt to show this exigency (the loss of the upper teeth) gives a new power to the lower ones, similar to the one which is present with the rodentia, namely, that they grow indefinitely for the sole purpose of rendering such an unfortunate being capable of cutting his "bread and butter," and to speak without "lisping;" and these results they ultimately accomplish! There is in the

*TO THE EDITORS.

GENTLEMEN: Having removed from Briton to 19 Dorset Place, Dorset Square, London, which has so sorely deranged my manuscripts, that they present a melancholy aspect, appearing disordered and confused, so that I am under the necessity of sending this as the concluding paper. And, probably, that some of your learned readers may be induced to take up the subject, as it is both important and at the same time of practical value, and do it greater justice than I can hope to do for some time to come. I am, gentlemen,

Yours, very truly, J. L. LEVISON.

first place, this well marked difference—that in man the crowns never grow, either as a whole, nor does the enamel seem to be renewed; for when there is any chemical action exerted on it, the substance is thinned, showing the subjacent dentine; and if a portion is broken off, the latter blackens, from being deprived of its hard and solid protection. But the rodentia, from their habit of constantly gnawing hard substances, actually *wear* away by mere mechanical friction, the sharp, chisel-like edges of their teeth, and which would have been worthless as instruments, if there had not been a provision made for the renewal of the enamel cutting edge, and we find that such is the case during their growth and maturity. That perspective wisdom is manifested in this as in all the works of the Creator. We may further remark, that by the mechanism of the jaws of the rodentia, the front teeth form a most complete cutting apparatus. For behind the central incisors, there are placed two short teeth, with a space, so that when the upper ones shut, they fit in a well fitted groove, their sharp cutting edges chiseling the pieces without any great effort.*

Now in the particular case we propose examining, there is not any actual increase in either the crowns or the fangs, but the elongation is a provision to render the injury to the health of the individual less than it might otherwise be, if there remained an incapacity for teeth to be antagonized, and which depend solely on their actual approximation; otherwise they lose all their vitality in the buccal cavity.

The proximate cause for the elongation seems to be, the absence of resistance in the antagonizing instruments, and the elongation of the incisors is a provision in order to render the individual less inconvenienced.

For, we observe that when the resisting power is no longer exerted (as in the case of the loss of the upper incisors, or when any of the molars are removed) the consequences are the simple result of there being no longer any antagonism. It is then that the remaining teeth, the consequences of those which have been

* There is not a doubt, but this beautiful contrivance suggested the method by which a blacksmith separates a piece of heated iron on a chisel-like wrench.

removed, though they do not grow, there is in effect a process which acts as an equivalent. The alveolar processes, of the teeth which are deprived of the resisting power of those with which they have acted in the normal condition of jaws, gradually contract from below, and hence the fangs are raised or pushed forwards by degrees, until the crowns find a resistance against the absorbed alveoli covered with the gums, in either jaws in which there is an absence of the corresponding teeth; and thus there is some compensation for the loss of the teeth either destroyed by disease or accident.

The final cause of this arrangement is rendered obvious by the fact that when the remaining teeth, ultimately, come in contact with the sockets, which have become consolidated, they are assisted in some slight degree in the manducatory process. And hence, when nature is the dentist, there is a compensation for the previous injury. And we are led to infer that she never contemplated artificial teeth as a better substitute! But as man is endowed with intellectual powers fitting him to be, not only a student but also as an interpreter of the laws of his wonderful organism and of all things in the outer world, that it may be presumed he was intended to apply his knowledge, however derived, for his own advantage.

It is, therefore, not surprising that he should have attempted to compensate for accidents or injuries from disease, when either affected the symmetry or the usefulness of any part of his body. Hence, the rude attempt in the early periods of society to supply the loss of teeth; particularly by means of rudely-formed blocks of hard wood, such as the *lignum-vitæ*, nicely cut and adjusted to fill up the spaces between the remaining molars.* The wisdom of this plan may be inferred by the fact, that when one or more of the molar teeth are extracted, the separated teeth cannot approximate, because there exists an insuperable obstacle, from the irregular absorption of the alveolar processes in which the lost grinders had had

"A local habitation."

* This was actually the case in one of the mummies taken from a tomb in Thebes.

Sometimes, for example, the absorption may take place, giving a tendency to the anterior edge of the socket to approximate to the posterior edge, or *vice versa.* In either case there exists a bony-ridge as a barrier. If on the other hand, the absorption takes place from each side of the empty alveolus, the ridge is curved in a line with the remaining teeth. In which case their crowns may approximate, whilst the space between the necks of such teeth is nearly the same as when all the molars had been in situ. The consequence of this divergence is the cause of more or less havoc than merely the loss of one or two grinders. As the parts of the teeth which should cross each other (the incisors and cuspidati) and the molars which should meet in antagonism, are thrown, by this one circumstance, out of their natural symmetry, this interferes with the proper working of the whole dental apparatus.

It is then on this very account that artificial teeth are recommended as a *dernier resort*, to keep the jaws in such a condition that their symmetry and mechanical motions may neither be impeded nor distorted. And this rule particularly applies to the restoration of any of the molars. For by a natural action of the jaws, they are drawn forcibly together by the temporal muscles, when the molars in both the upper and under have their broad surfaces brought in contact with great force, and by a marvellous mechanical contrivance, move with a springy motion in their respective sockets. This simple and beautiful arrangement to obviate the effect of concussion, has suggested the buffers of the railway carriage.

In the application of the compensating principle, as applied to the teeth, there is effected all the advantage of actual contact, without the risk of breaking the hard enamel of them, which must have resulted from the natural brittleness of this crystalline substance, had such provision for their safety been withheld. Besides, which, if the force of the collision had not been broken on the motion to which allusion has been made, the vessels of the periosteum would have been liable to serious injury. There is another advantage from this most excellent and most perfect arrangement. The lower jaw having a free motion has

been compared, by Richerand and others, to a hammer; and the immovable upper jaw, to an anvil. Whilst the actual force in the jaws of a strong man, taking the various muscles into consideration, essential to produce their compound action, it is said to be equal to four hundred weight crushing power!

If, therefore, there is a loss of the molars, from the jaws being then incapable of that antagonizing action we have spoken of—the lower jaw must strike with an extraordinary force the incisors, and so injure them by this unnatural shaking, that their continued existence is greatly jeopardised. From these general observations it will be obvious, that I advocate the aid of art in cases of loss of one or more of the molars, but not affixed to plates, either of gold, platina or palladium, and this for two reasons.

1st. Because they must be fixed by clasps of the same metal.

2d. That any metal, from being alloyed, must be liable to be oxydised, which increases the tendency to produce some galvanic action, more or less affecting the chemical quality of the saliva, by converting its free oxygen into an acid, *sui generis*, the effect of which is gradually rendered manifest by the removal of the earthy-portion of the remaining teeth.

These consequences are obviated by using blocks of the tusk of the hippopotamus. And even if their grinding surfaces wear away rapidly, or if they become blackened—there is avoided all galvanic action, and there is preserved intact the perfect flavor of the food, which is not the case when any metal is used.

I, therefore, enter my deep protest against all who boast that artificial teeth are equal to those of nature. They cannot be. It is a physical and mechanical impossibility. For the natural teeth being fixed in a receptacle, and by a most simple and marvellous contrivance are thus enabled to tear, cut and crush the aliment, without injury to themselves or their "local organs;" it is impossible to supply any artificial substitute to ensure these advantages and immunities. For all artificial teeth must be fixed so as to press on the living gums, which are liable to be affected with more or less inflammatory action, as a result of a foreign agent acting mechanically on them. And in the case

where there seems no immediate evidence that such is the case, time demonstrates the contrary. That there has been a *chronic* and not an *acute* affection by the gradual absorption of the substance of the gums and the subjacent bone.

The hippopotamus blocks are less injurious in effecting these results, than when any metallic base is used. Hence, even the former, although but imperfect substitutes, are still useful in preventing more complex injury and certain deformity, and may be regarded among the useful arts.

But when advertising *charlatans* compare them with nature's handiwork, nay, who even affirm that they are superior, then, indeed, we cannot help regarding all such artificial productions as mere miserable substitutes, suggested by a strong necessity, but still defective when compared with those which formed a part and parcel of the living organism, and which were intended by the divine and infinite Creator to be *permanent;* and as they are not so, is but one among many other penalties we pay for our state of civilization.

19 *Dorset Place, Dorset Square, London, Jan. 10th,* 1856.

ARTICLE III.

Sketches of the Knowledge of Teeth.—The Origin of Medical Science. By GEORGE HAYES, Esq., Dentist, Conduit Street, Hanover Square, London.

THE history of dental science is, like any other, interesting on account of showing where human ken and knowledge began, and where they have led hitherto. It exhibits to us the many phases of human investigation, thought and industry, to arrive at certain aims and scopes demanded by, and connected with, the general exigencies of the times. But the history of any department of medical science exhibits also that melancholy

truth, that while medical science has expanded and advanced, that *high* and *sublime object* thereof—*man*, has deteriorated. The science of dentistry, hardly touched by the writers of antiquity, has grown up to an extraordinary bulk, which, however, like other branches of pathology and therapeutics, may now require to be involuted and contracted, by the aid of hygeistic principles. Dental science in fine has originated from such slender sources, and has been so completely identified with the other branches of surgery and medicine, by the writers of old, that we cannot dilate on it without alluding to the former.

The origin of medical appliances and science—appertaining to times anti-historical, cannot be looked for in history, but must be traced by analogy and pshycological and physiological induction. Man in his rudest state must soon have found, that if any external accident, a fall or hurt has injured him, the approach to the fire, or in other cases the contact with cold water, &c., would relieve him. And thus, he must successively have arrived at the conviction, that there exist certain external appliances and remedies, which will allay some or other morbid state of his body. As in the lapse of time, seers and prophets or priests took hold of man's affairs, both religious and social—medicine also must have necessarily become one of their studies and occupations; a field, which once entered upon, became boundless, as most other pursuits of the human mind. Whether we may derive the origin of civilization and science from the Egyptians or Hebrews, we find that in both countries *it were* the priests, who first practiced the art of healing, and with the former nation *dentistry* is especially mentioned as one of its departments. Herodotus, who had travelled through most parts of the then known world, (500 B. C.,) but who, for his descriptions, availed himself often of much older dates, as is the case with the narrations of the Egyptian priests—has left us the following interesting passage: "The art of medicine is thus divided amongst them, (the Egyptians,) each physician applies himself to one disease only and not more. All places abound in physicians; some physicians are for the eyes, others for the head, others for the teeth, and others for internal disorders."

Herod. ii, 84. Although we may almost say, that the objects of Egyptian antiquity, which have reached us, are numberless; still, with the exception of some doubtful *sondes*, no surgical instrument has been discovered yet; which, if they were of steel, may be easily accounted for. Still, the following passage, derived also from Herodotus, clearly proves that surgical instruments of some kind were in use even in the remotest antiquity. "It happened not long after, that Darius, in leaping from his horse while hunting, twisted his foot—and at first thinking he had about him those of the Egyptians who had the first reputation for skill in the healing art, he made use of their assistance. But they, by twisting the foot, made the evil worse. As he still continued in a bad state, some one had before heard at Sardis of the skill of Democedes, the Crotonian, made it known to Darius. Upon which, when Darius put himself under his care, he, in a little time, restored him to his health. This Democedes visited Polycrates, after having left Crotona and went to Ægina; having settled there, though he was unprovided with means and had none of the instruments (!) necessary for the exercise of his art, he surpassed the most skillful of their physicians." Herod. iii, 129, 131.

It is also difficult to pronounce on the priority of the custom, prevalent both in Egypt and Greece, to suspend votive tablets in the temples; and to inscribe columns with medical and other precepts. In Egypt, the sciences, said to have been discovered by Thouth, were early collected into a book of papyrus entitled *Æmbre*, into which the rules of medical science were consigned. In the time of Jamblichus, the Egyptian priests possessed medical books ascribed to Hermes, of which some treated of surgical instruments.

As the sacred books of the Hebrews are neither numerous nor of extensive scope, they afford few glances at the state of their medical knowledge, except that it was very restricted and crude, as perhaps the maladies of those times were also few and of a milder character. The passage moreover from Gen. l, 2, "and Joseph ordered his physicians (!) to preserve his father with aromatics," might indicate that the Hebrews had derived

their medical knowledge also from that, even then, highly cultivated nation, the Egyptians. The Holy Writ informs us, that the Hebrews used lotions, frictions, pigments and unctions, cataplasms of figs and a certain sort of *gum*, and employed ligatures for fractured limbs—remedies common with most infant people. But it is hardly to be supposed, that they performed *operations*, as their dread of dead bodies was even supported by an especial law, and made them averse to any procedure where life and death are so contiguous.

With the Greeks, the inventor (*god*) of medicine was Esculapius, a son of the sun, and his sons Podalire and Machaon were counted by Homer amongst the heroes who besieged Troy. In Greece (as well as Egypt) it were the *priests* who attended to the ailments of man, and the temples destined for it were called Æsculapions, mostly situated in high and healthy localities, surrounded by shady groves. One of the most ancient was that of Cnidos, and thence came forth the first known *book* on medicine; and one of the most important works of Hippocrates, (460, B. C.,) is a refutation of these knidian gnomes.

The medical men (Æsclepiades) of those times formed a corporation, which, at the beginning, had the exclusive privilege of medical practice in the Æsculapions and outwardly. They also had the obligation of recording on tablets, the principal cases and their treatment, which were then brought into a more digested form and called *knidian sentences.* The exercise of the healing art, by priests, in fine, implies an admonition on the exhibition of that *humanity* and conscientiousness, which constitute the highest qualities, especially of the operative surgeon.

In the earliest times, the precepts and operation of the healing art were kept exclusive—caste-like, handed down from father to son, &c. Besides the then generally rare use of scriptorial art, Galen (lib. ii,) expressly states, why at first nothing on the art of healing was written down: "They learnt," says that ancient author, "from their youth the art of anatomy from their fathers, and considered it unnecessary to write thereon, as upon the art of writing itself. In the course of time, however, the art was not only propagated by inheritors to sons and other re-

lations, who had to practice it from their very infancy; but it was communicated also to strangers, and to such men as were distinguished by certain qualities." What Galen says here of anatomy may be as well applied to all other departments of the healing art. At first, however, the precepts and operations were kept *secret*, and only communicated under the seal of secrecy. Thus, in Lucian, we find the following words put into the mouth of a priest of medicine: "A sacred mysterious oath binds me: I am commanded by the last words of my dying father."* In that fine piece of composition, called *the law of Hippocrates*, is to be found the following passage: "holy things are communicated only to the initiated, but they must not be trusted to the profane, before they have been initiated into the orgies of the science." From this mysterious character of medicine sprung up those beautiful axioms, which would do honor to the best amongst us, even in this refined age:

"If you love men—you will love your art."

"The physician, who is also a philosopher, is to be reckoned with the gods."

The Æsculapions were, moreover, not only temples and places of treatment for the ailing, but became necessary also schools of the medical art. Such were those of Cyrene, Rhodes, Cnidus and Cos, about 500, B. C. But it is difficult to fix their precise date of antiquity. The way in which medical writings arose out of their temples, were manifold. The sick, who went there to be treated, assumed the custom of leaving behind some written memento of their thankfulness towards the gods, and which characterized and described the malady, of which they had been cured; or they brought thank offerings to the gods, made donations to the priests, or presented some sacred vessel to the temple. Or they had the parts at which they had suffered, made of gold, silver, ivory, &c., and also exhibited them in the temples. Or the names of the patients, their maladies and the remedies resorted to were inscribed on metal tablets or on columns. It became also customary to inscribe there the

*Lucian. Tragopadagr., v, 270.

preparation of some other remedy. These tablets were probably soon annotated by the priest-physicians, and long before Hippocrates, there existed a collection of semiotic precepts, known by the name of the "caik prenotions."

The Cnidion school divided the maladies into a great number of species, seven maladies of the bile, twelve of the bladder, &c. It would, however, appear, from a passage of Plato, (lib. iii,) that the Æsclapiades did not prescribe for anything but wounds and *acute* diseases; as Plato reproaches Herodius, of Sylimbria, for prolonging the life of sickly persons, and making them thus linger by a long malady, rather than let nature free them of their sufferings by death. But Herodius employed chiefly *gymnastics* as a curative agent, and thus another radius was added to the sphere of Greek medical art.

The preceding may be called the *first period* of medical science—as an esoteric knowledge preserved amongst a caste or family. But the approach of the fifth century before Christ was an epoch of *considerable revolution* in the vast domain of the human mind, in which, medical science had its appropriate share. It was the era of Socrates, Plato, Anaxagoras, Empedocles, Herodotus and Thucydides, as well as that of Phidias, Sophocles and Euripides. It was the epoch of the emancipation of medical science, and what had been before *theology* became now *anthropology*—a change, on the advantage of which we do not wish here to dilate. Still, out of the temples learned men began now to occupy themselves with the study of *nature*, alloying it with all the fancy and sublimity of that philosophy peculiar to the Greek sages. Such were Melissus, Domenides, Empedocles, &c., whose writings have, however, only reached us in scanty fragments. But out of this novel tendency arose the medical school of Croton, in Italy—the first which seemed unconnected with any Æsclapion or the Æsclapiades; and Herodotus, who lived not far off, inform us, that it was the most celebrated of those times.

The mind of man thus cultured became prepared for the appearance of *Hippocrates*, one of the greatest medical men who ever existed. It is in his writings where first some positive

facts on the maladies of the *teeth* are to be found, and which we have (we think) collected for the first time. It was also for this reason, that we have prefaced some data of the earliest Greek medical history; as else, the mentioning of Hippocrates and his knowledge of the human teeth, would stand solitary and unconnected. In appreciating the opinions of this great man, we must judge him in connection with the very imperfect knowledge of anatomy and physiology of those times, now twenty-three centuries ago. He says: "There is a glutinous increment from the bones of the head and the jaws, of which the fatty part is dried up, and the teeth are made harder than the other bones, because there is nothing cold in them." "In the fœtus they are nourished by the food of the mother and after birth by the milk which the infant sucks from the breast." He alludes to the *wise teeth*, and holds the opinion, that to have a greater number of teeth is a sign of longevity.

The following therapeutic observations are very interesting: "With a child suffering under phagedenic affection the upper and lower teeth fell out; as the bone (jaw) had become hollow. The losing of a bone of the palate causes the lowering of the nose in its middle; the losing of the upper front teeth causes the flattening of the base of the nose. The fifth tooth counted from those in front; four roots united, two by two to each of the neighboring teeth; and all turned inside by their points. The third tooth is more subjected to suppuration, than all the rest; and the thick flux of the nostrils as well as the pains of the temples come chiefly from that tooth. This tooth is much subject to caries, especially the fifth. This tooth had a tuberosity in the middle, and two in front; a small protuberance on the inner side, at the side of the two others, was first subject to caries. The seventh has a single large root pointed. With the boy of Atherata the lower tooth to the left and the upper to the right, the right ear suppurated, at the period when he did not suffer any more." Epid. iv, 19. "The wife of Aspasius had violent tooth-ache, the jaws swelled, having used a callert oxium of castoreum and pepper, she was relieved." Epid. v, 67. "Melesander, the gums being affected, swollen and very painful, he

was bled on the arm; Egyptian alum helps at the outset." Epid. v, 69.

"At Cardia, the child of Metrodore, in consequence of toothache, had a sphacelus of the jaw overgrowing flesh on the gums, the suppuration was middling, the molar teeth and the jaw fell (out.)" Epid. v, 100.

We have reproduced these curious extracts as we have found them, although some are not quite clear—the further explanation of which, we leave to other hands. What must strike evey one is, that we find here mentioned diseases of the teeth of a severe character. Hippocrates does not state that *extraction* had been resorted to. This anomaly may be partly explained by the fact, that Hippocrates (or his compilers) does, in the main, only speak of the symptom and issues of maladies, without stating what remedies and expedients were resorted to. Still, it is interesting to inquire about the first glimpses of anatomy and its natural consequences (!)—surgical operations.

With the Egyptians the dread of the dead was so great, that the person who made the incision for introducing the *aromas* into a dead body, had to run away after he had made it, &c. But it seems, that when the Ptolemies had succeeded to the Pharaohs—they, as universal Mœcenses of science and art, were also induced to patronize anatomy; and it is especially recorded, that Erasistratus and Herophylus, (400, B. C.,) obtained through their favor the bodies of malefactors for dissection; and it is even said, that they dissected the bodies of the *living*. However this may be, a practice of anatomical inquiry must have led to the only *real* and *genuine* knowledge of the fabric of the human body, and thence to the conviction, that certain ailments and defects may be removed by anatomical procedures. Strange to say, however, that it is the same Herophylus and another physician Heraclidus of Tarent, who are recorded as dental operators. The passage alluded to runs thus: "Herophylus and Heraclidus of Tarent have recorded a novel mode of extracting teeth. Because it is said, that Erasistratus had deposited some leaden *odontogogam* which we should call a tooth-drawer, (denti-ducum,) at Delphos in the temple of Apollo,

as a matter of show, and to prove, that the teeth ought to be removed that are loose or relaxed or for which a leaden instrument (*ferementum*) will suffice. How, however, carious (*exesi*) or loose teeth are to be removed, I have spoken of in my books of medicinal responsions."* A variety of corollaries may be deduced from this passage, amongst which that, that many teeth do not require the forcible application of steel—may be consoling to a number of nervous and timid patients.

The mentioning of Egyptian alum as a dental remedy by Hippocrates, is also very curious, as we come to know, that even now this salt is considered a secret remedy against tooth-ache amongst the Jews; and as their talmudic traditions remount to the times of Moses, it would be curious to think, that even the knowledge of this simple remedy should have remained with them since times immemorial.

With Hippocrates, in fine, we may consider the *first epoch* of dental medicine to be concluded—one of extreme simplicity, if not of limitation.

ARTICLE IV.

Manner of Swaging the Binding or Rim of Plates for full sets of Single Gum Teeth. By H. N. Case, dentist, Little Rock, Ark.

Never having seen any given plan by which to *fit perfectly* the rim of suction plates for full sets of single gum teeth, and deeming it essential, if not absolutely indispensable to fine work, I send you the one by which I work, for publication, if you think it of sufficient interest to the profession.

Chapin A. Harris, in his "Principles and Practice," speaks,

* Cœluis Aurelinus de Morbis atcutis aque chronicis. Amstel. 1709. 4to.

both of rimming and turning down plates, but I have never been able to make either plan available as given by him.

To turn down a plate would add very much to the finish of the piece, but very little to the strength, and then the plate cannot be fitted to the border with pliers after swaging, or changed in any way which it is often necessary to do. On page 725 of Harris' Principles and Practice, whence I got the idea, the author speaks of rimming plates for block teeth, but gives no plan by which this rim can be applied or fitted to single gum teeth. It cannot be fitted to the teeth themselves, neither before nor after soldering, without breaking them; hence the necessity of a metallic cast of the gums to fit the rim to. I make this rim to extend down upon the gums from $\frac{1}{8}$ to $\frac{3}{16}$ of an inch as the case will admit of.

The great superiority of this kind of work as regards cleanliness, strength, comfort in wearing, and beauty of finish, will suggest the great necessity of its being as perfectly done as possible.

But I will describe briefly. I strike up my plate in the usual manner, but lest this might be mistaken, I give it. First mould in fine sand from a plaster model, neatly trimmed and smoothly varnished, cast in this mould with zinc, and obtain counter-model, by immersing this to the proper depth, in melted lead and type-metal. Now cut your plate to extend as far up over the alveolar border as is desired, and swage thoroughly. When the swaging is complete, anneal and swage two or three times more, to prevent the plate from warping.

Now try the plate in the mouth, and complete the fitting with the pliers if necessary. Now take the articulating-model, select and fit the teeth nicely, put on backings, arrange the teeth upon the plate precisely as you wish them to stand when completed; and if the backings do not fit well to the plate, fill in with gold foil when you come to solder. Take the plate containing the teeth from the articulating-model, and place it upon the original plaster-model.

Now warm a roll of yellow wax, and place it around the plaster cast just above the plate, press it down upon the model, allowing

it to extend down upon the gums far enough to take their impression perfectly as seen in Fig. 1. When this wax is cold, remove the wax from the lingual surface of the teeth, and remove the teeth carefully, so as not to spoil their impression in the wax B, leaving the plate in place. Oil the plate and wax, wrap with a strip of thick paper and fill with a batter of plaster of paris, as for an ordinary model; mould from this in sand and cast with zinc, which obtains the cast represented in Fig. 2. Now solder on the rim as wide as the case will admit

Fig. 1.

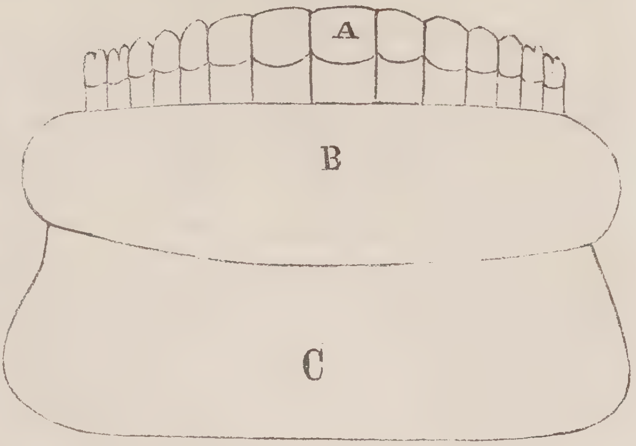


Fig. 2.

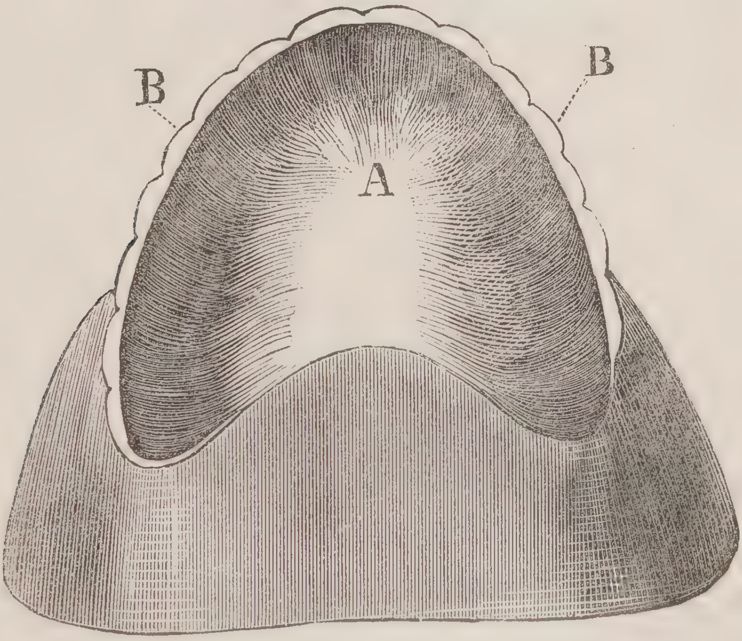
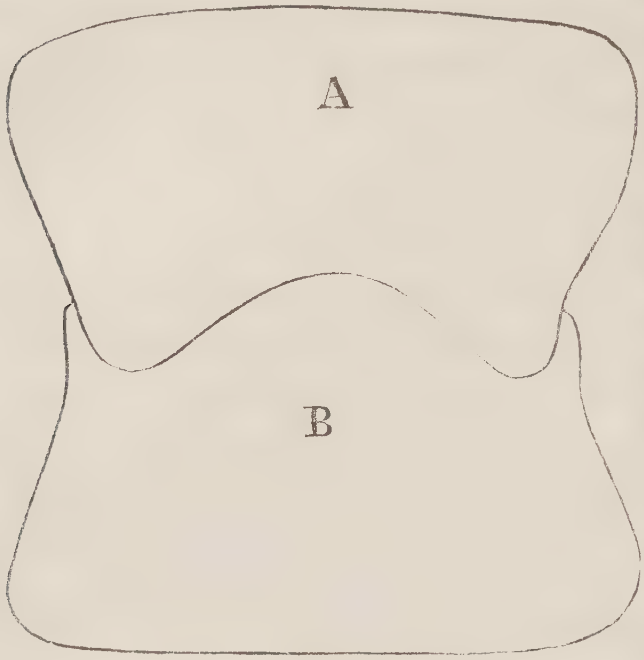


Fig. 1. A, the teeth attached to the plate by wax as arranged on the articulating-model. B, a roll of wax pressed down upon the gums so as to take their impression. C, original plaster-model.

Fig. 2. Representation of zinc cast, No. 2. A, perfect model of lingual surface of the plate. B B, perfect model of the gums to which the rim is to be nicely fitted.

of without showing; place the plate upon the zinc model, Fig. 2, and fit the rim with the hammer; or if desired, obtain counter-model, as in any other case. If your plate warps, as it is very likely to do in the many heatings and coolings necessary in attaching and soldering on the rim—restore it by placing it between the original zinc cast, and zinc cast, No. 2, as seen in Fig. 3, and swage thoroughly.

FIG. 3.



Now return your plate to the articulating-model, and return the teeth to their place within the rim, with wax upon their lingual surfaces for the greater security, and they are ready for the investment. If the work be well done, it is impossible to get the point of the finest instrument between the rim and the gums.

Here let me add a caution. Use borax sparingly. I have never had but one plate to warp in the last eight years, and that was caused by the glass of borax hardening between the teeth when separated by the expansion of the plate in soldering. I cannot be mistaken about this, for three of the teeth were broken lose from the backings by it, and I found the glass of borax so thoroughly united to these teeth, that it was with difficulty that I could remove it. And, indeed, I am inclined to think this the great stumbling-block to the profession in this never-dying theme of "springing of plates."

FIG. 3. A, original zinc cast. B, zinc cast, No. 2, the same as represented in Fig. 2.

ARTICLE V.

Valedictory Address to the Graduating Class of the Baltimore College of Dental Surgery, Delivered March 4th, 1856. By Solyman Brown, M. D., D. D. S.

Gentlemen Graduates:

"Just twenty minutes!"—Well then, if I *ought* to confine myself to the third part of an hour, in this address to the graduating class, out of pure economy of time and patience, as I have been confidentially advised, in another city, I must at least ask the privilege of regarding the *porch* of the structure, erected merely for temporary use, as no integral part of the temple itself.

Yes—"twenty minutes and *no poetry*." Such are the terms of the injunction kindly laid upon the speaker.

When first I received the flattering intimation that the honor of pronouncing this Valedictory Address, would be accorded to me, a dentist of the commercial metropolis, jealous peradventure of the monumental city, informed me in a friendly manner, that another member of the profession whose name was not divulged, tendered me the cautionary advice, "to limit my discourse to twenty minutes, and introduce no poetry, inasmuch as the Baltimore College is *down upon* poetry and long speeches."

This advice, whether just or not, has spared you, young gentlemen, half an hour, at least, of common time, and half a quire of "*common place.*"

So much you may pass to the credit of my unknown adviser. It is not for the speaker to decide whether you shall put the credit in the column of dollars and cents, or of mills and decimals.

The *ante-room* being thus far entered, and finding a little more opportunity to explore and expatiate, before entering the main temple of thought, allow me to admit that it is indeed a great merit, in public discourse, to condense and consolidate both thought and language.

True poetry is always such a condensation. And yet even good poetry is not necessarily suitable for all subjects and all occasions. So much we readily concede to the wisdom of our cloud-wrapt Mentor.

Acquiescing, therefore, in his charitable advice, instead of giving poetry on this occasion, in rhyming couplets, I shall read only alternate lines and alternate pages, and that will make it prose, saving you just seventy-five per cent. of the infliction which you must otherwise have sustained.

Thus far, gentlemen, be so kind as to regard yourselves as having been tantalized by the characteristic garrulity of an "old fogy," a fossilized relic of the eighteenth century, resolved on escaping by some stratagem, "the twenty minutes rule."

Lest any of you should find it difficult to imagine why a man because well stricken in years should adopt the *soubriquet* of "OLD FOGY," it ought certainly to be explained.

After searching carefully all the lexicographers, we arrive at the true etymology of this word. An OLD FOGY is one who has passed through almost all the *fogs* of life, leaving them behind him for the benefit of his juniors, himself emerging into pleasant sunshine.

And, this brings us over the threshhold, through the vestibule, into the open arena of professional speculation, where I am pleased to meet, for the first time and probably for the last, a graduating class of the Baltimore College of Dental Surgeons.

This college together with the American Journal of Dental Science, and the American Society of Dental Surgeons, constituted a few years ago, a triple confederation, with the avowed design of erecting dental surgery into an acknowledged science.

Like the Roman triumviri with Cæsar at their head, they *came* to the work, they *saw* its difficulties, and they *conquered* them.

The American society has finished its task, having been the fruitful mother of several state societies which are now successively taking her place, and performing her duties. It is doubtless best that the alma mater, venerable alike for years and usefulness, should quietly retire, and a general national conven-

tion composed of local societies, and private individuals, become her successor. Such an organization was partially initiated during the past season, with due forms and ceremonies, and it may possibly be best, that the entire profession should conspire for its success. The present is clearly an age of progress, and I doubt whether there be a solitary member of the original American Society of Dental Surgeons who would not heartily rejoice to see a better institution in its place.

What does it signify that *some* of these offspring of the superannuated parent, shall have vituperated and afflicted her, in her old age, only, that few mothers with very large families, fail to encounter the misfortune of having *some* wayward children?

"*The American Journal of Dental Science*," has nobly advanced, amidst interested obloquy and vigorous competition to its fifteenth annual volume, comprising already a complete library of professional literature, science and experience, honorable alike to its permanent editor and its constant supporters.

"*Esto perpetuo*"—may it live forever, at once the primogenitor and the contemporary of dental periodicals to the latest times. And why should it not? Can any other form or fashion of a journal, contribute more successfully to the credit, the pleasure, and the profit of the profession which it has so long and so nobly served?

Its principal contributor and conductor, through its whole course of popularity and usefulness, would have well deserved the enduring gratitude of his profession even had he never written his other unrivalled works, the "Dental Dictionary" and "Dental Practice." These two superadded to the other, constitute a *trio*, which will perpetuate his fame to very remote posterity.

Long may he live to enjoy, among other blessings, the emoluments of industry and the luxury of fame!

The first American College of Dental Surgeons, which was also the first dental college of the world, at least during the present historic era, has, in like manner, been useful, honorable and prolific. It has three living offspring, vigorous in health and honorable in renown; besides one that perished in its in-

fancy as is sometimes the case with the *feeble* progeny of the human race.

As competition is said to be the life of trade, so mutual emulation and friendly rivalry, may, peradventure, contribute to the growth, the vigor and the permanency of all the dental colleges now in vogue. Some of them are situated very remotely from all others in the broad domain of our national confederacy, where states are like kingdoms in the old world; and consequently have ample scope, through diameters of hundreds of leagues, in a thickly populated country, for patronage and support.

The two well known facts that several dentists previously engaged in practice, have perfected their studies in these institutions, and returned to their business with redoubled popularity; and that all, or nearly all, the graduates of these colleges have been received with implicit confidence in the spheres of their practice, should induce many others of both these classes of individuals to follow their example. To a dental practitioner of either limited or unlimited preliminary advantages, and actuated by an honorable ambition, the outlay of time and money required for one or two annual courses in a dental college, would doubtless be twenty-fold repaid in future usefulness, reputation and emolument.

I am fully aware that the truth of these averments will be flatly denied by a large class of individuals who discover no personal advantage in either their acknowledgment or promulgation. But, let such persons be assured that, although they may never attain to the perspicacity of vision necessary to enable them to see, *in theory*, the truth of this doctrine, they will inevitably be implicated, *practically*, in all its issues, as surely as effects shall continue to follow causes.

If a hundred established practitioners of the younger class, and another hundred students who had never been in practice, were annually to throng the lectures and practical demonstrations of each of the dental colleges in our country, and there are none in any other land, this noble concourse would do no more than strict justice to itself, and to community, its patrons.

The practice of dentistry is destined to be elevated to higher

usefulness than it has ever yet attained; and this can be effected only by the better education of its operators.

As a class graduating at this college, and as individuals ready to enter upon the active duties of the profession, you, gentlemen, have taken, in my judgment, greatly the wiser course, by seeking and finding practical and theoretical knowledge at one of its acknowledged sources; at the very first fountain that gushed from the chaos of the past; the veritable "pierian spring" of your professional philosophy! Used aright, this eminent advantage will bring its influence to bear upon all your future fortunes. It will give you *professional currency* wherever science is known. There is not a kingdom in the old world, nor a republic in the new, in which the degree conferred by the Baltimore College of Dental Surgeons would not impart to you all the professional authorization that either law or custom demands.

Go forth, then, where taste and duty call, accompanied by this diploma, with science in the head, energy in the heart, and skill in the hand, capable of conferring solid benefits on the community that sustains you.

Make it a point of honor and of conscience, in all your works, to give an absolute *equivalent* for the *fees* that you demand.

To do *more* is charity, which sometimes you may afford; but to do *less* is fraud, which you never can afford: for he who shall succeed in making fraud profitable, will have countervailed all the laws of eternal providence.

This single idea opens to us the gate leading to the grand gymnasium, in which are contending all the giant and pigmy theories of dental practice. In the centre of the arena are two valiant knights, clad in massive armor, one of precious *gold*, and the other of ignoble *tin*.

Whilst Magnus Apollo favors the former by enveloping his coat of gilded mail in an atmosphere of glory, threatening to blind his adversary; swift-winged Mercury, substituting speed for splendor, flies to the rescue of the latter, and submerges him in a *molten sea*.

In this dilemma, less the conflict should be tragic, as when Milo, of Greece, slew a Thracian bull by a single blow of his

fist, and then eat him up at a meal, the valiant emperor, Caöuchouck, with his vassal kings, Rubber and Percha, interferes.

Placing these two redoubtable warriors between the gladiators, the blows are parried, the arrows repelled, the spear points broken. Thus baffled and exhausted, the combatants retire unvanquished from the field, ready for fresh encounter when they meet alone.

To drop the figure, which has become too hot for handling, we descend to simple phraseology, leaving the athlætæ and the demigods to their fabulous renown.

We find at the present day a veritable gymnasium and veritable contestants for honor and for profit in the several departments of dental practice. We find the long-established dominion of gold, employed as fillings for teeth, and as plates for the mouth, incontinently assaulted; and gutta percha, india rubber, tin, cadmium, quicksilver, "*et id omne ignobile genus*," claiming its place, and usurping its authority. And as if these were not enough to eject the most precious of these metals from this branch of art, we at length find gold itself divided against itself. We find gold in foil pitted against gold in crystals.

And what will you do, gentlemen, in this chaos of conflicting pretensions? You will doubtless listen to the universal mandate which brings all nature into order and beauty. "Let there be light."

Truth is an ocean ebbing and flowing through creation. Errors are the bubbles on its surface. The ocean remains forever inexhaustible and undiminished. The bubbles successively explode, and their gaseous elements float away from human vision.

Every science, like that which you have studied, is a vessel floating upon the sea of human knowledge; and every art, like that which you propose to practice for the benefit of mankind, yourselves included, is an aggregate of skill and experience, which manages that ship.

The bubbles of error have not all yet exploded, and you will see them on your voyage dancing on the crest of every billow. Their buoyancy will betray them. Valuable knowledge dwells far beneath the surface, as gold sinks farther in unfathomable waters, than any baser metal.

The *plain and obvious things* pertaining to dental science and practice, are readily found, and eagerly seized by idle and ignorant pretenders, and used as evidence of a *title* to professional success; and these individuals perhaps never discover the true cause of their discomfiture. They wonder that a bubble so beautifully irridescent with prismatic tints of professional expectation, should burst and vanish in their grasp, leaving them to poverty and neglect.

The circumstance that you, gentlemen, are engaged in search of the deeper *strata* of knowledge and skill, in one of the earliest and best dental schools in our land, will clearly exonerate you from the stigma as well as the discomfiture of flippant empyricism. But as one of the probable results of your liberal course of study in a dental college, will be to render you spontaneously *conservative* of old theory and time honored practice, it may be well for you to remember that *progress* is the watchword of your camp, and *excelsior* the motto of your banner. Conservation of that which is old, should not always degenerate into rejection of all that is new. It has been well said, that the wise man acts from *reason*, the less wise from *experience* and the least wise from *authority*.

As rational men, therefore, you will be mainly governed by positive science and pure intellection; but you will not necessarily abandon reason by acting from experience; neither will you become fools by resorting to legitimate sources of information.

On bidding adieu to the faculty of the college and to each other, you will enter upon your professional duties wherever a disposing providence shall place you, as educated and authorized, and practiced operators, in the several departments of your profession. You will be confident that you have explored the stream of professional knowledge to its source; descended into its mines to their lowest stratum, and, that what you have not had an opportunity of learning in the science and art of dentistry, in its present state of advancement in our country, is not worth being either sought or known. This confidence will give you indomitable *energy*, and this energy will give you unquestionable success.

But what is success? It is easy to define what it is not.

It is not necessarily nor generally, either worldly *wealth* or contemporary *fame*, which many seek so madly. If it were, the lives of many of the Cæsars and Napoleons of the world would not have been *failures.* For although the greatest of the Cæsars was compelled to borrow 40,000 sesterces, on his departure for the war in Spain, to place his private affairs in such a state, to use his own language, "as to make him worth just nothing at all;" that is, *pay his debts:* and although the first of the Napoleons, when departing for Italy, was unable to obtain credit of his *bottier* for a pair of military boots; yet both of these personages had unbounded contemporary fame, and controlled, at times, the riches of a continent.

All desirable *success* is the attainment of *useful ends* by *honest means.* And this most blessed boon, denied forever to self-aggrandizing and unscrupulous ambition, may be easily attained by every member of the class before me, with unerring certainty.

This desirable success *may* be indeed accompanied with both fame and fortune, as was the case with Washington; although the latter is rarely acquired by the mere labor of the hands, without adventurous speculations, either in "fancy stocks," or matrimonial alliances, both of which, as avenues merely to monetary riches will be avoided by the truly wise.

Moderate gains, attained by patient industry and prudent economy, are all the worldly wealth of a pecuniary nature which dental practice promises to its most faithful devotees; and a settled conviction of this fact is indispensably necessary to their success. Nor is this to be regarded as matter of regret.

Enormous fortunes, like prodigious dinners, are generally burthens to their possessors. The *plethora* of either is not to be desired.

If four hundred dollars is considerably more than the portion of each individual in the common property of our country, supposing it apportioned alike to all, surely three or four thousand dollars per annum, is nothing less than *ample compensation* for the annual industry of any individual, inasmuch as this amount would absorb a portion of the general wealth equal to that of

eight or ten of the non-producers, who are generally children, the aged and the infirm, the sick and the decrepid, to say nothing of the female half of the race, whose estimated earnings are classed in the columns of *duodecimals*.

Let moderation then, in all things, be your constant *safeguard* against the fatal reaction of blasted expectations. *Hope* being the last thing that dies in man, becomes his greatest oppressor when its cold remains lie lifeless on his heart. Hope, therefore, *sanely*, and be always contented with reasonable anticipations, and normal results.

But above all things else, learn, if not known already, that there are many things in life—even in mortal life—more valuable than fame or money, the attainment of which is man's *preeminent success*.

What will you say of a charming conjugal companion, the breath of whose love is sweeter than the gentle south wind whispering to a bed of violets?

What will you say of a group of laughing children, clambering upon your knees, hanging upon your lips, clustering about your neck, until you imagine the riches of the universe to be gathered at your fireside?

What will you say of the esteem of the wise and good, who covet your society, and bring you in return the society of those you love?

What will you say of the consciousness of performing your daily duties with promptitude and pleasure; of doing good to others without expectation of return; of cultivating the head and heart in the knowledge of nature and the virtues of christianity; and of coming at last to the ladder of the patriarch resting on the earth, and bearing your footsteps, in company with angels, to the highest heavens!

If there be not in such blessings the elements and embodiments of success, let fame and riches be cast upon the winds; for they are useless to man.

And now, gentlemen, having obeyed the twenty minute rule, I am sure you will allow me to superimpose upon the subject, a triple crown of scientific interrogations, in the form of problems,

to be solved by us or our posterity. Peradventure their solution will be postponed for the exercise of the mental acumen, of the twentieth century.

The first is this. Why does the melted wax of the common honey bee, when allowed to cool slowly in a thin stratum, assume geometrical forms of the same average size and shape of the alveoli of the comb from which the wax is derived?

Is it, that the wax undergoes incipient crystallization analogous to that of the basaltic columns of Fingal's cave, and the Giant's Causeway; or, has it some undiscoverable connection with the original cells of the honey comb, and the instinct of the bee that forms them?

The second problem is this. Why do all the colors of the solar bow, or prismatic spectrum, which is simply an analysis of the sunbeam, from black to white, namely red, yellow and blue, with all their shades and combinations, enter as pigments into the human hair, blue only excepted?

Is it, that nature in her characteristic economy of material, employs this color to paint the curtains of the sky, the wavelets of the sea, the scales of the fishes, the plumage of the birds, and the petals of the flowers, and can spare no more for the human body than just enough to tint the current of the veins, and give azure eyes to a portion of the race?

Let this problem be resolved by some of our numerous descendants who will be spared by the genius of the present age, the arduous necessity of discovering circumpolar ice fields, magnetic meridians, telescopic asteroids, electric telegraphs, and manslaughtering railroads.

The third and last of these knotty problems, harder to resolve than the oracle's response, may be thus expressed.

Why did the healing art, including medicine and dentistry, have, in darker ages of the world, a greater proportion of *quack* practitioners than any other art or science?

Let posterity in its generous zeal for useful discovery, possessing facilities unknown to the present age, grapple earnestly with this question, with such success as it may be able to command. It will do well if it find the true answer by the year

1956. It will probably succeed on the same day of the same year in which some stultified geometer shall accomplish the quadrature of the circle, and determine when a traveler, starting from the equator, will arrive at the north pole, by directing his course invariably midway between the north and the west.

Of one thing, however, we feel assured, in spite of all the incertitudes and infinitudes of science, that our learned successors in the fields of discovery, in whatever age or country their conclusions shall be made, will never ascribe the charlatanry of dental practice to the timely establishment and skillful management of the Baltimore College of Dental Surgeons.

ARTICLE VI.

On the Treatment of Teeth when the Nerve is endangered by Caries.

Believing the vitality of the pulp of a tooth to be absolutely important to its highest state of health, as well as its greatest permanence, I have always endeavored to preserve that vitality when possible.

Various expedients were resorted to in my earlier practice to effect this object, until I adopted a method of treatment, which, up to the present time, has constantly given me reason to believe it the most generally effective of any method known, at least to myself. It consists only in taking advantage of the protecting and recuperative power of nature, which she is so ready to exert when permitted.

It was while examining, with curiosity, this power, in relation to the formation of secondary dentine in teeth where the nerve pulp had been endangered but not morbidly affected, that the idea occurred to me of turning it to some practical purpose.

I prejudged, that, in cases where the nerve being very nearly exposed by the advance of decay, if the diseased action could be retarded, the pulp would improve the time so gained to throw out its defence against the approaching danger, in the form of secondary dentine.

With this idea I commenced the trial. At first, after removing as much of the caries as could be done without injuring the nerve, I made use of various applications having a tendency to arrest or retard decay; but later, adopted astringents and chlorine solutions mainly; which I still continue with a success that often surprises me.

The cavity having been thus prepared and treated, is made dry and stopped* temporarily, for from two to six months, the time depending on the apparent activity of disease, when the stopping is removed, further excavation made if it is found safe to do so, the applications renewed, and the cavity again stopped.

This process is repeated until the caries ceases to be active in its character, and a solid floor of dentine is found in the cavity. Then thorough excavation is performed and a permanent gold filling put in. The tooth thus retains its full natural health and permanency, as if the nerve had never been endangered.

I find the most convenient material for a temporary stopping, to be gutta percha, with sufficient fine spar or silex mixed with it to remove its elasticity when warmed. A portion of oxyd of tin, mixed with the same, renders it perhaps more preservative, but may be objectionable from its liability to produce discoloration.

*I use the word stopping, for the temporary, and filling, for the permanent operation.

ARTICLE VII.

The Present State of the Question—On the Glucogenic Function of the Liver.

In our last quarterly summary of chemistry, we gave an account of the interesting discussion on the subject of the power of the liver to transform albuminous materials so as to generate sugar, and supposed that the decision of the academy had settled the question. Such, however, is not the case. M. Figuier is far from considering himself beaten. He returns to the charge with great vigor, and argues his case with much pertinacity and ingenuity.

He again takes up the question of the presence of sugar in the blood of the *vena porta*, which he failed to show when experimenting before the committee. It will be remembered that he used, on that occasion, Frommhertz's test, (tartrate of copper dissolved in solution of potash,) but that the committee objected to it as unsatisfactory, and when, at their instance, he resorted to the fermentation test, he failed to evolve carbonic acid from the portal blood. The object of his third memoir is to point out the causes of this failure.

He asserts that in the portal blood, there is a peculiar principle which opposes fermentation, and which must be removed before that change can take place. To prove this, he took blood from the portal vein of a large dog, which had been fed several days on horse flesh, treated it with alcohol, acidulated it with acetic acid, evaporated it to dryness, treated the residue with distilled water, and filtered to get rid of albuminous coagula. The liquor was divided into two equal parts, one of which, without further treatment, was mixed with yeast, but failed to ferment. The second portion was boiled two or three minutes with five drops of nitric acid. An albuminous or caseous sediment was deposited, the clear yellow liquid filtered

off, and exactly neutralized with carbonate of soda. Then, on being mixed with yeast, it evolved carbonic acid, and after fermentation, responded to the tests for alcohol.

In this way, he says, he has already succeeded in exhibiting the presence of sugar in the portal blood by the fermentation test. He then goes on to show that Bernard's process of "killing the animal and taking the blood in the hepatic veins, that is to say, in the very midst of the saccharine tissue of the liver, is vicious." The rest of his paper is taken up with arguments on physiological principles, with which it is hardly worth while to trouble our readers.

Bernard, in his reply, contradicts the facts, and says that he has repeated Figuier's experiments several times, but has never obtained his results; whereas, on the other hand, he has never failed to get the fermentation, when those circumstances favorable to the presence of sugar in the blood of the portal vein exist. Hence he is disposed to regard the anti-fermentation principle as a figment of his opponent's imagination. Having thus disposed of M. Figuier, he goes on to consider the question how sugar is formed in the liver.

He gives a brief sketch of the various hypotheses to account for the origin of glucose; that of Schmidt, who believes its production to depend upon an oxydation of fatty matter circulating in the blood; that of Lehmann, who thinks it due to the splitting of hæmatosine into sugar and a nitrogenous matter, a change which that eminent chemist has actually accomplished, out of the body, on crystallized hæmatosine; and finally that of Frerichs, who believes the glucogenic action to be due to a power residing in the liver of decomposing certain organic matters which would give rise to urea and sugar. In all these he sees a tacit admission of a certain catalytic force exerted by glandular organs upon the blood in its passage through them. He inclines to another explanation, and thinks the action should be sought in the tissue of the gland itself.

To determine this point he carefully removed the liver of a recently killed dog, passed a powerful stream of water through the portal vein, till the liver became pale, and the water issued

from the hepatic veins perfectly colorless. The washing was still continued until the clear fluid gave no indication of sugar by the most delicate tests. The tissue of the liver was also examined and found to be wholly devoid of sugar. The organ was left in a vessel at the common temperature, and in twenty-four hours, was found to be strongly saccharine. This experiment its author considers to establish the facts that the liver contains two substances:

1. Sugar very soluble in water, which is carried away with the blood by washing.

2. Another matter so sparingly soluble in water as to remain fixed in the hepatic tissue, after the latter has been deprived of its sugar by washing for forty minutes, and which is capable of being changed into sugar by a sort of fermentation.

This property is entirely destroyed by cooking; portions of the same liver, remaining free from glucose or containing much of it, according as they were cooked or left raw. Twenty-four hours are sufficient to exhaust this material, since if at the end of that time the liver is washed free from sugar, it is never formed again. Another experiment proved that this substance was also insoluble in alcohol and that the dried hepatic pulp was capable of generating sugar when moistened with water. This matter belongs exclusively to the liver, since there are no traces of it in the portal or any other blood.

During life, this matter being constantly renewed in the tissue by its nutrition, serves as a perennial source of glucose. It follows from these experiments that the liver alone can generate glucose.

Shortly after this, the celebrated author of physiological chemistry, C. G. Lehmann, appeared with another memoir, "on the search for sugar in the blood of the vena porta." In this he states his method of detecting sugar in the blood under dispute. He takes the advantage of the known property possessed by the different varieties of sugar, of forming with potash, a precipitate insoluble in alcohol. He treats the blood with alcohol, evaporates the solution to dryness, and exhausts this extract with highly concentrated alcohol. To this solution, potash dissolved

in alcohol is added, and saccharate of potassa falls in a deliquescent mass, very soluble in water. The foreign substances such as chloride of potassium, carbonate of potash, and organic matter, do not interfere with the subsequent test, which is the old one of sulphate of copper and potassa. So delicate is this test that the author has succeeded in obtaining unmistakeable evidence of the presence of sugar in human urine to which one-hundred-thousandth of glucose had previously been added. He also discovered by it, sugar in the ovaries of mammalia, as well as in the albumen of birds eggs.

As an accessory test, he recommends that another portion of the saccharate of potassa be slightly audified with tartaric acid, and treated with yeast to produce fermentation. He has never noticed any substance thrown down with the saccharate which at all interferes with fermentation.

He objects to Figuier's plan of obtaining blood in such large quantities from the portal vein, on the ground, that such copious depletion brings not only blood from the neighboring vessels, but even fluids from the surrounding tissues, in virtue of the law of diffusion. He objects also, that, as the quantity of blood in an adult man does not exceed one-tenth of his weight, on taking such large quantities from the portal vein, it is absolutely certain that other blood must be mingled with it.

He, therefore, first kills the animal subjected to the experiment, then ties the portal vein close to the liver and empties it of its blood. Thirty-five to eighty grammes have thus been obtained from a single animal. Operating in this manner, this distinguished chemist has always failed to obtain sugar from the portal blood.

Anticipating an objection, which has actually been made to the small amount of blood employed in this investigation, he operated upon three dogs fed with meat, collecting and uniting the blood from all three. This amounted to 217½ grammes of blood, (equal to 3350 grains, or nearly half a pound avoirdupois.) Notwithstanding this large quantity was employed, no trace of sugar was found.

In order to determine whether glucose could be found when

a large quantity of blood was taken from the portal vein of a living dog, in which event, according to the preceding observations, it must necessarily have come from other sources besides the normal portal blood, he drew quantities approximating those on which M. Figuier operated. In the experiments of this kind, he obtained glucose every time.

His conclusions from these experiments he states to be:

"1. When too much blood is drawn from the *vena porta*, we do not obtain suitable blood, nor such as circulates normally in the vessel during life.

"2. When we place ourselves in such conditions as to obtain only the pure blood of the *vena porta*, no glucose is found in it during the digestion of meat."

The next question which he set himself to solve, was that of the presence of a glucoside or copulated sugar in the blood of the portal vein. To determine this, he digested the alcoholic extract of portal blood with diastase and then boiled it with a few drops of sulphuric or nitric acid. No fermentable substance was at any time obtained. The examination of the stomach and small intestines of dogs fed on meat, for the same substance, led also to negative conclusions.

As for the statement of Figuier, that the portal blood contains a substance which prevents alcoholic fermentation, Lehmann unites with Bernard in denying it. He added sugar in small quantities to the alcoholic extract of this blood, and never found the alcoholic fermentation to be prevented or retarded. Furthermore, he thinks that, if these experiments of Figuier were correct, they would not prove the existence of a substance preventing fermentation, but only the presence of a glucoside or copulated sugar, susceptible of development into glucose in the liver, and would, therefore, confirm instead of controverting Bernard's views.

Figuier, in his reply, disingenuously, as it appears to us, avoids Lehmann's strong objection to his method of obtaining portal blood, and complains that that chemist ought to have employed the same process which he used. In criticising the process of the German chemist, he strongly objects to the use of caustic

alkali, which he says forms, with great difficulty, a glucosate with the secondary sugars, and that such salts when formed, are destroyed almost immediately upon coming in contact with water. He further insists that the saccharine ingredient of portal blood cannot be compared chemically with glucose.

In reply to Lehmann's assertion that the discovery of a glucoside would support Bernard's theory, he objects that, in that case, the liver would not be said to secrete sugar, but merely to modify the glucoside *in transitu*, just as the stomach transforms aliment into peptones.

To this point has the interesting discussion under consideration arrived. It must be acknowledged that Figuier has contended with distinguished ability against his great opponents, but it must also be admitted that at present the weight of argument inclines to the other side. How future researches may affect the question it is impossible to foresee. One thing, however, is very certain; we shall emerge from this contest with clearer notions of the necessary precautions in dealing with organic chemistry, and a better idea of all the functions in debate, than we could possibly have had without this searching and acute criticism.

A paper bearing on this subject, from the pen of Dr. Pavy, has been recently published in the proceedings of the Royal Society. He finds that sugar exists in the arteries, the capillaries, and even in the veins, where it is still undergoing destruction, but that this destruction is more complete in some veins than in others, so that while the portal blood may be wholly destitute of sugar, that of the femoral or jugular veins still contains it in appreciable quantity. A moment's consideration of the preceding remarks will show how important a bearing this fact has upon the whole discussion relative to the portal blood.

This led Dr. Pavy to a consideration of the circumstances under which the saccharine matter of the blood is destroyed in the economy. He found that Liebig's hypothesis of its combustion in the lung is not sufficient, for, on obstructing the respiration of an animal nearly to the point of fatal asphyxia, the destruction of sugar still went on. On injecting the blood of

one animal through the inflated lung of another, he found the destruction of the sugar to be as great as during life, but when he defibrinated the blood, the change did not occur.

Observations on the disappearance of sugar, in blood out of the body, corresponded with this result. The blood set aside to undergo spontaneous coagulation, was found to contain very different proportions of sugar in its two constituent parts. The serum contained quantities of it, while none could be discovered by the most delicate tests in the coagulum, showing that the organic decomposition is the true cause of the change. The oxygen of the air seems to be concerned in it only so far as it promotes this nitrogenous decomposition. On the completion of the metamorphosis, the blood is found to be acid, a reaction believed to be due to the presence of lactic acid.

Applying these facts, we find that a nitrogenous substance, in a state of change, is capable of exciting a molecular movement in the sugar, which results in the formation of lactic acid. "If the molecular changes, occurring during the decomposition of a nitrogenous substance, be capable of converting sugar into lactic acid, why should not the molecular changes occurring during the building up or elaboration of this same nitrogenized compound effect the same? Indeed, we have seen that the process of destruction is carried on to a certain extent in the systemic capillaries, and more especially in those of the chylopoietic viscera, where the molecular changes of nutrition are also correspondingly carried on with greater activity than elsewhere. So that analogy and experiment would tend to show that the physiological destruction of sugar is owing to a process similar to fermentation induced by the molecular changes occurring in the nitrogenized constituents of the animal during life; and, in accordance with this, we find lactic acid present in the system, and largely separated from arterial blood by the muscular tissue, and the secerning follicles of the stomach."

A. S. P.

ARTICLE VIII.

Report of a Case of Mercurial Stomatitis, with Remarks. By R. BRUCE REYNOLDS, D. D. S.

OF late years, since the reckless employment of mercury, formerly so common, has been generally abandoned, the opportunities for witnessing severe cases of salivation have become fewer. As it has fallen to my lot to see one in which the local inflammation was great, the fever high, and the convalescence unusually rapid, in consequence of the prompt and satisfactory action of the remedies employed, I have thought that it was of sufficient interest to be reported in full.

Miss F——, aged about 18 years, a seamstress, of lax fibre, lymphatic temperament and scrofulous appearance, sent in haste for my friend, Dr. James Dwinelle; the messenger saying that "she was bleeding to death." I accompanied him, witnessed the entire progress of the case, and kept minutes of the various changes which took place from day to day.

On arriving we found her pallid, gasping, bleeding profusely, and apparently on the verge of syncope from exhaustion by hemorrhage. A wash bowl near her, contained fully a pint of dark, grumous blood, mixed of course with saliva, and the attendants informed us that she had lost much more than that. The mouth could only be opened about half an inch for inspection, but that was sufficient to reveal the source of the hemorrhage. Just behind the incisor teeth, in the neighorhood of the ducts of the sublingual gland, there was a fungous growth, rising as high as the level of the incisor teeth, which was at first mistaken for a clot of blood. It was soon found, however, to be very sensitive and to bleed at the slightest touch. Indeed, pressure upon it caused the blood to flow from it as if oozing from a compressed sponge. For the rest, all the salivary glands, the tongue, cheeks and gums were highly inflamed, the mucous surfaces being of a dark crimson color and a spongy texture.

The cheeks were tumid, pale and doughy, the parotids swollen and extremely tender, the complexion pale, and the fetor of the breath intolerable, clearly indicating a mercurial taint. The tongue was furred, fissured and swollen, the tonsils enlarged, and indeed the entire buccal apparatus greatly engorged. The surface was hot, the condition evidently feverish, the pulse 100 in the minute, vacuous and quick.

Upon inquiring, it was ascertained that about three weeks before she had been affected with piles, for which a neighboring practitioner had recommended mercurial ointment to the tumors, and internally confection of senna, with which it was afterwards discovered that mercury had been mixed. Both had been used several times every day, up to the day before the hemorrhage occurred.

Brandy was at once administered locally as an astringent, and internally as a stimulant.

The ulceration of the mouth being considerable, it was determined to employ nitrate of silver. A strong solution of the fused salt, (half a drachm to the fluid ounce, of distilled water,) was applied by a soft camel's-hair pencil to the bleeding surface and to all the ulcerated tissues of the mouth.

It speedily and completely arrested the hemorrhage and exerted a decided antiphlogistic influence upon the local inflammation. Solution of acetate of lead, with laudanum, was then used, as a wash, for the double purpose of constringing the vessels and soothing the excessive pain. For the purpose of correcting fetor she used interchangeably with this wash, Labarraque's solution of chlorinated soda, as a lotion. To correct the condition of the blood, chlorate of potash was administered internally by the following formula:

℞	Potassæ chloratis, . .	ʒ ss.
	Syrupi simplicis, . .	℥ ijss.
	Aquæ, ...	℥ xijss. M.

Dose, a table-spoonful three times a day.

At night, on account of the excessive irritation, she took twenty-five drops of laudanum.

Nov. 30th, 10, A. M. The patient had passed rather a rest-

less night, her condition, however, was better, her pulse 90 and fuller, her skin soft, and the inflammation of the mouth decidedly diminished. The mouth could be opened wider so as to show small ulcers on the sides of the tongue and the mucous lining of the cheek. The nitrate of silver was again applied as before, and the same local and general treatment continued.

8, P. M. No particular change, except that she could open her mouth better.

Dec. 1st, 8 A. M. Has had a restless night, but is more comfortable—continue treatment.

7, P. M. Tongue furred; mercurial fetor gone; pulse 94. She complains of pain in the left tonsil. Her bowels being torpid, half an ounce of castor oil was given at once, and at bed time she took ten grains of Dover's powder.

Dec. 2d. She has had a good night's rest; and her bowels have been freely moved. She is in every respect improved.

Dec. 3d. She has a slight hemorrhage, but, in other respects, continues to improve. Nitrate of silver is again applied and arrests the bleeding. The other treatment is continued.

Dec. 4th. Has had a comfortable night. The tongue is clean; the mercurial odor entirely absent; the pulse 75. She has entirely recovered the use of her jaws.

8, P. M. Complains of great soreness near the root of the tongue on the gum of the left side, and upon examination, a small red and tender spot, about the size of a half dime, is discovered. Nitrate of silver is applied and the washes continued as before. From this time her convalescence was rapid. It should be remarked that during the whole course of the treatment she took wine whey, beef tea and similar sustaining diet.

Remarks.—It is well known that the flow of saliva may be increased by a great variety of causes, both local and general. Of the local stimuli and of the influence of the mind upon this secretion, it is not necessary to speak. The agents, which taken internally, are capable of producing this effect upon these glands, are said to be numerous. Antimony, nitric acid, iodine, chlorine, bromine, arsenic, lead and gold, among inorganic: and opium, conium, belladonna, xanthoxylum and others, among organic substances, have been accused of causing ptyalism.

Iodine is the only one of these of which I intend speaking. The following sketch of its action is taken from Piggot's Dental Chemistry.

"Iodine stands next to mercury as a general sialagogue. The mercurial fetor has been stated by some observers to be present in this form of salivation, while others deny that there is either fetor, sponginess of the gums, or loosening of the teeth. The explanation of this discrepancy will probably be found in the facts recently elicited by M. Melsens' researches. This accurate and careful observer shows that mercury may remain a very long time in the system, in consequence, probably, of its property of forming insoluble compounds with the various organic substances of which the body is composed; and that iodide of potassium is capable of dislodging it, and making it soluble, so that it will again enter the current of the blood, and may, consequently, if set free in sufficient quantity, produce its primary effects of salivation, erythema, &c. Dr. Budd relates a case in which, five months after taking mercury, a patient was violently mercurialized in this way by iodide of potassium.

"The tendency of iodine and its compounds to pass off through the salivary secretions has already been mentioned. Like most other substances, however, it may change the organ of elimination, and may be discharged through the skin, the kidneys, or even by means of the fluid evacuated in consequence of the operation of a seton. Under circumstances like these, its elimination by the salivary glands is of course checked, if not entirely suspended.

"Pure iodic salivation differs materially from that produced by mercury. The vascularity of the mucous membrane of the mouth and of the salivary glands may be unchanged, but oftener it is increased, the glands especially becoming tumid and tender. The secretion itself contains an unusual amount of mucus or albumen, the excess of one or the other of these elements, constituting its chief deviation from the healthy state. The unpleasant taste of iodine is often perceived in the secretion, and weight at the root of the tongue, aching of the jaws and singing in the ears are complained of. An increased flow

of tears and of nasal mucus generally accompanies this form of salivation."

There are a few points in mercurial salivation on which some remarks may be needed. The chemistry of the saliva is greatly modified. It becomes thicker, more viscid, more mucous, more alkaline. It is nauseous to the taste, has a peculiar disagreeable, penetrating odor, which has been attributed to the greater quantity of Wright's ptyalin which has been found to be present.

The symptoms of the disease, I quote from Dr. Wood's work on practice of medicine.

"Among the first indications of the action of mercury are often a metallic taste in the mouth, like that of brass or copper, and some increase of the saliva. At the same time, a close examination will detect a slight redness and swelling of the gums, particularly about the necks of the lower incisors, while somewhat below their edge, a broad white line may often be observed, depending on opacity of the epithelium. The patient soon begins to feel some uneasiness, complaining of soreness when the gums are pressed, and of pain when the teeth are forcibly closed together. There is also a sense of stiffness about the jaws when the mouth is opened, and they feel as if projecting above their usual level. The flow of saliva increases, the inflammation extends, the gums and palate become obviously swollen, and the tongue covers itself with a yellowish-white or brownish fur, and is often so much enlarged as to exhibit the impression of the teeth when projected from the mouth. The throat frequently becomes sore, and the cheeks, and salivary and absorbent glands, swollen and painful. There is often severe tooth-ache or pain in the jaws. A whitish exudation along the edges of the gums is very common. The breath, which, from the beginning, and sometimes even before the appearance of any one of the symptoms mentioned, has a peculiar disagreeable odor, now becomes extremely offensive, and in bad cases almost intolerable. Ulceration often occurs, especially about the necks of the teeth, which are consequently loosened, and in the cheeks, lips and fauces. The ulcers often have their origin in a vesicular eruption, such as that already described.

(See page 501.) The whole mouth with its appendages is sometimes so much swollen that it can scarcely be opened; and the tongue so much enlarged as to project beyond the lips. The patient is now nearly or quite unable to articulate, or to masticate his food, and sometimes can scarcely swallow. A case was related by Dr. Physick, in his lectures, in which an obstinate dislocation of the jaw resulted from the enormous tumefaction of the tongue. Hemorrhage is not an unfrequent attendant upon these bad cases, and is sometimes so profuse as to be alarming. Sloughing also takes place, and portions of the jaw bone are occasionally laid bare. There is always, in the severe cases, more or less fever, which is partly symptomatic of the local affection, partly the direct effect of the mercury. Death, from the exhausting influence of the irritation, want of nourishment and hemorrhage, has occurred in numerous instances; but the patient generally recovers from the worst forms of the affection, though sometimes with a deformed mouth. The tongue and cheek have occasionally adhered at points where their ulcerated surfaces were in contact; and a surgical operation has been necessary to remove the evil."

In regard to the treatment, that portion of it which seemed specially efficacious was the local application of nitrate of silver and the internal use of chlorate of potash. The former arrested the hemorrhage and changed the condition of the mouth almost immediately. For the effects of the latter I refer to certain passages in recent journals which have been pointed out to me by a medical friend.

The *Bulletin de Therapeutique*, as quoted in the Dublin Medical Press, of Sept. 5th, 1855, contains a recommendation of this remedy, from Herpin & Blachthey: begin with a dose of half a drachm a day, and gradually increase it.

"M. Gustin, intern in pharmacy, wishing, for the sake of experiment, to submit himself to the action of chlorate of potash, took two drachms at nine o'clock in the evening. On awakening, a sort of astriction, with slight nausea, was perceived in the mouth; the gums were a little rough to the touch. Although the saliva was not sensibly lessened, it appeared to him to be

more watery than usual. This observer has also proved that the chlorate of potash is in great part eliminated by the urinary secretions."

Under this treatment it is said all the symptoms disappear in four days. In corroboration of this, the Medical Times and Gazette, of Nov. 19th, 1855, records a case of Mr. Hutchinson, in which all fetor had disappeared on the third day. He gave the medicine in fifteen grain doses, thrice daily.

ARTICLE IX.

Specimens of Dental Pathology, Gutta Percha, &c. By ALEXANDER M. HOLMES, D. D. S., Morrisville, Madison county, N. York.

INCLOSED I send you a molar tooth the ossified pulp of which completely filled the cavity at the time it was removed. This tooth had been filled and the nerve protected by a metallic cap covered with gutta percha. One year afterwards the tooth was extracted preparatory to inserting an artificial denture.

I send also a few specimens of colored gutta percha; although they by no means represent the extent and variety of shading of which a pure article of this gum is susceptible, these having been prepared from a very dark and impure specimen.

As gutta percha has to some extent engaged the attention of the profession, I take pleasure in communicating to you the result of my experience in its use, for temporary purposes during the past five years.

As a temporary filling, in cases where the lining membrane of the pulp cavity is nearly or quite exposed, and the dentine in an inflamed condition, I regard the preparation of Dr. Hill as superior to any material with which I am acquainted. Filling with this article does not necessarily increase the irritation;

it is easily accomplished, and possesses the two-fold advantage of a non-conductor, and of preserving the tooth until its healthy condition is so far restored as to admit of a gold filling. Many teeth may thus be saved with their nervous tissue unimpaired, which, had no preparatory treatment been adopted, must either have been lost or the patient subjected to the unpleasant operation of destroying the nerve.

As a base for the support of artificial teeth, gutta percha can be advantageously used; especially in temporary cases, as when the gums and alveoli are in a diseased condition, and the irritation of a metallic plate would render its use impracticable.

Teeth constructed on a base of this material can be worn by the patient with comparative ease. It is also admirably adapted to fulfil the indication frequently met with in persons of advanced age, who, by reason of the tenderness of their gums, cannot be persuaded to endure the irritation resulting from the first use of a metallic plate.

Again, where, (as in many cases,) we desire to restore the *contour* of the face, it may be neatly and effectually done by covering the plate, properly extended, with this material. To accomplish this, the extended portion of the plate to which the gutta percha is to be applied, should be thickly perforated in order to allow the gum to pass through and unite the two layers, thereby increasing its durability and preventing its pulling from the plate. I have usually made these punctures with the punch in ordinary use for lining plate teeth.

It will also be found very useful in the laboratory when the ordinary impression cup cannot be used advantageously, as one can be formed of this material in a few minutes, and of any required shape.

The process I have adopted in the preparation of this article as a support for artificial teeth is very simple. Where it is desirable to give it the color of the natural gums, a pure article of gutta percha is essential to success. No amount of coloring will perfectly obviate the dead shade imparted to the gum by the impurities contained in most of the specimens found in our markets. The coloring matter having a vegetable origin, and

being minute in quantity, does not impart to the gum any injurious property, or in the least impair its texture.

My process is this: Take any quantaty of chloroform suitably colored to produce the desired shade of body, and add to it as much of the gum as it will dissolve; having done this and shaken it well, the solution may be poured out upon a marble slab to allow the chloroform to evaporate, after which the remaining mass should be softened in hot water and well worked together. It may then be pressed, rolled or drawn out into any required shape.

A suitable variety of shades may be given it by the use of lakes, varying from purple to pink, adding, at the same time a small quantity of gum gamboge. If the gutta percha has originally too dark a shade, a little white may be required. The coloring material should be finely pulverized, and ground in alcohol before it is added to the chloroform.

According to my experience, the best method of using gutta percha as a support for artificial teeth, is to swage a narrow plate, perforate it as above directed and to this attach the teeth; or if a clasp case, then the clasps also, in the usual way.

After the base has been suitably fitted to the die, the plate and teeth should be heated and pressed down firmly upon the gutta percha, which, passing through this "cribriform plate," and uniting with that on the opposite surface, thus renders the work firm and durable. If an atmospheric case, it should be supported by a narrow strip of plate, or two or more pieces of wire extended across the roof of the mouth, or if preferred, a wire frame like that recommended by Dr. Trueman may be used. The former process has, however, been most satisfactory in my practice as in most cases before the absorption of the alveoli, the teeth used must necessarily be short, thereby rendering their attachment by any other method I have yet tried, very difficult and unsatisfactory.

Without some such support as that above mentioned, a gutta percha case of sufficient strength to answer the purpose will be found too bulky and cumbersome to be worn by our patients.

The piece should be kept dry until a sufficient quantity of the

gum has been moulded upon it, in order that the union may be perfect, after which, in the finishing, either cold or hot water may be used, as best suits the convenience of the operator.

That the above hastily described process may yet be greatly improved, I shall not permit myself to doubt; and the suggestions I have ventured to make have been less with a view to instruct the members of our enlightened profession, than to enlist them in the further investigation of this subject.

ARTICLE X.

Chloroform and its Management.

In our last number we made some remarks upon the occasional fatal effects of this anæsthetic, and their probable cause. Since the publication of that article, another interesting discussion of the question has taken place in the Medical Society of London. It is of such general interest that we have concluded to make a brief abstract of the report given in the Medical Times and Gazette of February 2nd.

Dr. Snow read a paper in which he mentioned the results of certain experiments with chloroform upon the lower animals. In them, when the vapor was sufficiently diluted with air, the respiration failed first, and the circulation ceased afterwards, for want of the stimulus of red blood. When, however, the vapor is too concentrated, it is absorbed from the lung, and circulating through the coronary arteries, sets directly upon the heart, stopping its pulsation. In this manner he believes the various accidents to have happened.

He then went on to reply to Dr. Black's theory, that death took place by simple asphyxia, and assigned the following reasons for believing it to be incorrect.

"1. The process of dying by asphyxia, occupies from four

to nine minutes, after the access of air to the lungs is completely cut off; but no medical man could overlook the fact, that his patient was not breathing, and persevere in preventing his doing so for this length of time.

"2. In the greater number of cases of death from chloroform, the patient really inhaled the vapor, so as to be quite insensible from its effects, before the symptoms of danger set in. Out of 44 deaths from chloroform, 7 took place when the surgeon was just about to begin the operation; 12 occurred during its performance; in 8 cases the operation, being of short duration, was completed before it was discovered that the patient had expired; and in the remaining 17 cases, the inhalation was discontinued, at some period of its progress, owing to the sudden occurrence of alarming symptoms.

"3. In every case in which the state of the pulse had been noticed at the time of the accident, it was found to cease suddenly and abruptly. This is totally different from what occurred in asphyxia, where the pulse retained its strength for some time, and then gradually diminishes in frequency and force.

"4. In twelve of the cases of death from chloroform, the face was observed to become suddenly pale at the moment when symptoms of danger set in. This symptom was indicative of cardiac syncope, and was incompatible with asphyxia; it had probably occurred in many cases where it was not recorded.

"5. In several of the cases in which death occurred during the performance of the operation, attention was first called to the patient's danger by the sudden stopping of the hemorrhage; a symptom which also proves death by syncope, and not by asphyxia.

"6. When animals are killed suddenly by chloroform, so as to imitate the accidents to the human subject, the blood is found to be of a florid color in the lungs immediately after death.

"7. Except sometimes in the case of children and lunatics, it is not the custom to restrain the patient, so long as he is conscious. If he complain of the frequency of the vapor, it is accommodated to his feelings; and therefore, it is impossible

that death should take place from the cause indicated by Dr. Black, unless in children and lunatics, to whom no accident from chloroform have yet happened.

"8. The vapors of sulphuric ether is as pungent as that of chloroform, but accidents do not happen during its use.

"A serious error with regard to chloroform, is to suppose the patient safe so long as he had sufficient air for the purposes of respiration; the truth being, the more air he breathes, the greater is his danger, if the air be too highly charged with vapor. The air breathed by the patient should never contain more than 5 per cent. of chloroform; if it contain 8 or 10 per cent. it is liable to cause sudden death by suspending the action of the heart. He recommended the use of an apparatus, for regulating the quantity of vapor of chloroform in the air; but those who prefer to use a handkerchief or sponge, may avoid risk, by diluting the chloroform with an equal measure of rectified spirit before using it. He considers that artificial respiration, very promptly and efficiently performed, affords the best prospect of success."

In the discussion which followed the reading of this paper, many interesting points were discussed. The success of different physicians in the use of artificial respiration varied very materially. Some had found it of no service, while others had perfectly succeeded.

ARTICLE XI.

Dental Hygiene.

In making a summary retrospect of dental literature for the past few years, I find a strange lack of able treatises upon dental hygiene. We have reasonably well written articles upon almost all other articles, and innumerable bad ones, no

doubt, but that branch of our practice which treats of the prevention of disease, is almost a dead letter in our literature.

The fact is, we have been so continually discussing dental education, amalgamation, *rhysodontrophy*, or some such a word, operative and mechanical dentistry, that our primary wants have been too much overlooked.

The study and application of hygienic treatment should be the first and constant care of the dentist, the very base of his practice, if success and deserved profit be his object, for it is a requirement which precedes all others, and is always present in every patient who has become intelligent enough to understand his own wants, and the skill and care with which they are treated; but, this great system is particularly required in the practice with young children before the adult teeth have made their appearance, which is too often confined merely to the premature extraction of the deciduous, with corrections of various irregularities, and sometimes the occasional filling of carious teeth, and various other purposes.

Hygiene is the care of present conditions of the body, which produce healthful consequences in the future, therefore requires the application of much scientific knowledge, and the exercise of experienced judgment, made daily applicable in the fulfillment of some great law of our organism. Through this is found the care required by the maternal parent, in the selection of the food which should constitute her diet during the period in which the child is dependent upon her for its nutriment; for, as this is found possessed of the required particles which constitute the different parts of the body, with the smallest amount of useless or waste matter, so will the child most rapidly thrive and be capable, through vigorous health, of throwing off morbific influences, which, under differently constituted systems, would be attracted rather than repelled, and thus through an acquired weakness of constitution, become a prey to most of the maladies prevalent.

We are made most sensible of the truth of this fact in the almost universally decayed condition of the teeth, scarcely has it been our pleasure to encounter more than two sets of

healthy adult teeth during our whole practice, and in these cases, I am confident, that the customary neglect to which the teeth are subjected, would inevitably destroy, and that in a short time, by far the greater majority of those coming under observation; one of these individuals in particular, has impressed me forcibly with the truth of this position, he is between 35 and 40 years of age, is constantly exposed to various temperatures of climate, being a traveler—smokes and chews inordinately, drinks freely and with considerable regularity, is, in fact, most irregular in all his habits, and yet his dentine is entirely free from all disease, perfectly sound and beautiful in every particular. The gums have always represented to me a slight degree of inflammation, yet if so, have no representation in the consequences of such a condition being present; but the teeth themselves are beautiful, perfectly regular, and I have never seen but one case in which the dental circles were as large, or in which the individual teeth were as large as in this case.

Now this can only be explaned, by the fact, that such teeth have been formed under the full and undisturbed requirements of nature, each particle of matter has been furnished by the nutrition, just at the moment required, neither being burthened by too much of the animal, or of the earthy, all the tissues entering into the formative processes, have been undisturbed in their functions, therefore performing their duties in the most perfect manner, and of course observing that timely order, which permits the proper anticipating development to take place, so that in such a process, the maxilla presented room in abundance for the teeth to take their places, and in regular order; the bones of the body were similarly developed, forming a secure base and support to those muscles and ligaments, which otherwise distort and derange the true relation; to such perfection morbific agents are innocuous, and a lifetime will pass without degeneracy and decrepitude.

To a superficial glance this may appear drawn too high, that such exceptions do not establish rules, but I contend that it is these exceptional cases which do establish rules of the

most universal application, because they prove that in the absence of known abuses, great laws are established, producing, when uninterrupted, admirable perfection; means entirely suitable to the wants are admirably supplied by an infinite wisdom, and the laws of animal economy being derived from this source are universal as are all other natural laws. We, as dentists, have not only to do with these grave formative principles, but to the correcting of and infringement upon, the laws of health affecting the teeth in all conditions; we therefore turn from these cases respecting purely maternal guardianship to those more properly within the sphere of office practice. In the first place, few practitioners recognize the fact, that there is even a remote possibility of preserving, through life, imperfectly formed teeth, by a judicious and timely management of children through and after the period of dental replacement, but it is not to be surprised at, when you find many proposing to practice, entirely ignorant of the age of respective eruptions, as well as the true causes which operate to the ultimate destruction of almost all teeth, certainly they appreciate a few of the causes, but are even scrupulous in absenting many of great importance, how then can such institute a prevention? The first cause operating to producc dental caries is, imperfect formation and premature development, caused by irregularities of diet, regimen, order, &c., in the maternal parent of which we have briefly spoken, and producing soft and chalky teeth on the one hand, and irregularity and general unfitness of means to an end in the other; a secondary cause, is the defective physical formation in the teeth themselves, inviting and fully assisting, by their irregularity, depression and corrugation, the action of all acrimonious fluids, which of course bathe their surfaces; such morbid influences acting upon connecting soft tissues, transmit them, by direct means, through the mucous membrane and digestive processes to the whole system, thus giving, by a reflex action, another fearful source of diseased teeth. Besides these, there are other causes, as well as many subdivisions of the foregoing, but these will suffice to extend this article, perhaps to the limits of your convenience, and we

therefore, will confine our remarks to a brief consideration of the treatment to be adopted in prevention of these evils. During fœtal existence too much care cannot be had over the food taken by the mother, as well as the influences, both mental and physical, which surround her, as these all, in every degree, operate to the advantage or disadvantage of the fœtus. This fact is too generally acknowledged to require any argument to sustain; therefore, the only difficulty lies in the just discrimination of the most suitable food to be taken at such time, as well as the guarding against those powerful mental impressions to which females are so peculiarly liable, and which sometimes effect the most astonishing revulsions in the whole economy.

Food which is most nutritive and easily digested is that which is much the most preferable, excluding large proportions of meats, high seasoned dishes and rich gravies; free quantities of stimulating drinks, particularly those engendering feverish excitement, disturbed circulation and incomplete aliment, of course forcing matter unprepared into the blood for nutritive distribution; all erratic feeling and passionate excitement, acts, either to the entire suspension of digestion, or the premature elimination of matters which burden the nutritive and formative economy, perhaps more than any one irregularity. It is evident from these few facts that fœtal growth cannot proceed under such a pressure of active derangement, nor can we have those parts entering into the formation of the teeth well prepared for their future labors, when the very germ of their origin is defective and disturbed. Again, at birth, the food of the mother is that from which the infant's life is sustained and its parts formed, the teeth during all this period are being moulded and composed, and the formative particles are derived from the food of the parent, which, if not fully furnished with those matters demanded in the structure of perfect dentine and enamel, their structure must of necessity be actively defective. Anticipating their formative growth and eruption, the health of the infant should be relatively cared for, as regards its cleanliness, exercise, free air and pure atmosphere. The entire cleanliness of the mouth should at all times have due consideration, both before and after

first dentition, at which time ordinary nutritive food should be given with but a very small proportion of meats. The teeth should be carefully brushed twice daily, and the gums kept in perfect health, presenting a hard surface and rosy pink color. The extraction of the temporary teeth will only be found necessary to prevent irregularities in the due relation of the permanent, which must be carefully guarded by securing timely room for the just advent of all the permanent front teeth, either by the extraction of one or more of the back teeth on either side as the case may be, until all stand in their proper places without undue pressure from each other; this can be obtained by skillfully attached ligatures or constantly applied pressure by the patient or by plates, bearing inclined planes, which act in the direction the irregular tooth is required to take. There is nothing more important than to secure to every young patient a dentine free from all pressure of one tooth against another, so that slight spaces may be found between every tooth and its neighbors, the lodgment of all corrosive matters will be absolutely prevented when due cleanliness is had by means of the brush after each meal, as well as upon retiring and rising. Any substance that can be introduced between the teeth of comparatively soft fabric will be found advisable in promoting such cleanliness. These few ideas hastily thrown together will only express common facts which every professional man fully understands, but about which few converse or contribute additional facts to our literature. It should be the constant theme of converse with our patients, when courteous politeness will admit its instruction.

A. A. B.

ARTICLE XII.

The Wax "Problem."

At the close of an address delivered, March 4th, 1856, before the graduating class of the Baltimore College of Dental Surgery, Dr. Solyman Brown, of N. Y., proposed several "problems," and added that "peradventure their solution will be postponed for the exercise of the mental acumen of the twentieth century." A few hours study of the "first problem" has enabled me to spare the doctor the trouble of waiting so long.

"The first is this: Why does melted wax of the common honey bee, when allowed to cool slowly in a *thin* stratum, assume geometrical forms of the same average size and shape as the alveoli of the comb from which the wax is derived."

I pass over the forced analogy of the basaltic columns of Fingal's cave; and also the mysterious "connection with the original cells of the honey comb, and the instinct of the bee that forms them," for I find in the *wax itself* sufficient reason for the appearance above mentioned.

Beeswax is composed of two substances, *cerin* and *myricin*—the former, existing in the proportion of about 70 per cent. is brittle, *crystalline* and volatile—the latter is non-crystalline or amorphous.

If a quantity of wax be melted in any vessel whatever and then suffered to cool, the margin of the fused wax is first solidified, and presents a homogeneous appearance, because the more rapid cooling of the mass touching the vessel prevents the formation of any but minute crystals of *cerin*, which hold the congealed *myricin* in their meshes. Presently, however, as the temperature of the hotter middle portion is lowered, large crystals of *cerin* shoot out from the edges, or spring up elsewhere at the surface, and intersecting each other give rise to "geometrical figures," triangular, four sided, five and six sided, and of various sizes depending upon the *quantity* of wax employed, the thick-

ness of the stratum and the gradual or sudden cooling of the substance. It is worthy of note that hexagons predominate, especially in square vessels, and that every where the angle of intersection tends most conspicuously towards 120°.

Hardly do the *cerin* crystals limit spaces at the surface than the enclosed *myricin* hardens and *nearly* obliterates the "figures," and so on until the surface becomes even: but if, when a *deep* vessel is used, we watch the moment at which the central figures become visible and then break the crust near the edge and *quickly* pour off the still melted wax, we will have upon the under surface of the crust permanent ridges intersecting each other.

It is an error to suppose that the surface of spontaneously cooled wax is uniform—on the contrary, the figures may still be observed by reflected light—and further, if the cake be again melted the *myricin* yields first to the heat, and the network of *cerin* crystals reappears there where fusion is beginning.

As I have remarked the thickness or thinness of the stratum does not affect the process further than by determining, in conjunction with the lesser or greater rapidity of cooling, the *size* of the crystals of *cerin*—indeed the whole matter may be readily observed by placing under the microscope a plate of heated glass, covered with a delicate varnish of wax and suffering it to become cold.

These facts are perfectly in accordance with *laws* which may be thus expressed: 1st, A *thin* stratum of a hot saturated solution of any crystallizable substance or the melted substance itself, as wax, sulphur, &c., will yield small crystals upon sudden cooling. 2d, A large mass of the saturated solution or of the melted body, will yield large crystals if the cooling process be conducted very slowly.

As to why *cerin* crystallizes and *myricin* does not crystallize, or in fact why wax exists at all, I doubt if the "mental acumen" of any century will ever be able to declare.

CHRISTOPHER JOHNSTON, M. D.

BALTIMORE, *March 6th*, 1856.

SELECTED ARTICLES.

ARTICLE XIII.

On a New and Advantageous Mode of Preparing Alluminium. By PROF. H. ROSE. Translated and read before the National Institute, Washington, D. C., Oct. 5, 1855. By J. TYSSOWSKI, U. J. Dr.*

SINCE the discovery of aluminium by Wöhler, Déville has recently taught us a method of obtaining it in larger connected masses, in which this metal shows qualities, which had not been observed in the metal as obtained in the form of a powder by the process of Wöhler. While in the latter form it burns with great brightness to a white clay, it may be, if fused into larger balls, heated to redness, without perceptibly oxydizing. These differences may be attributed to finer division and greater density, although according to Déville, Wöhler's metal contains some platinum which accounts for its less fusibility.

After the publication of Déville's investigations I tried also to obtain aluminium from chlorid of aluminium and sodium, by means of an additional dose of sodium. I did not follow entirely the method of Déville, but stratified the salt with the sodium and then applied heat. I however obtained no satisfactory results. Rammelsberg also followed closely the method of Déville but obtained no good results; moreover he was seldom able to prevent the bursting of the glass-tubes with which he experimented in consequence of the action of the vapors of sodium upon the chlorid of aluminium. It appeared to me that considerable time, labor, expense and long experience would be necessary in order to obtain even small quantities of this remarkable metal.

*Poggendorff's Annalen, vol. xcvi, page 152.

The application of chlorid of aluminium and its compounds with the alkaline chlorids, is particularly objectionable for the reason that they are volatile, attract moisture very readily, and therefore the access of air must be prevented when treating them with sodium.

I, therefore, early thought of substituting for the chlorid of aluminium the fluorid of aluminium, or rather the compounds of the latter with alkaline fluorids and which are known to us from the investigations of Berzelius. Berzelius pointed out the strong affinity of fluorid of aluminium for fluorid of potassium and fluorid of sodium, and that the cryolite occurring in nature is a pure combination of the fluorid of aluminium with the fluorid of sodium.

This compound, in consequence of its constituents, is as well adapted to the preparation of aluminium by means of sodium, as the chlorid of aluminium and its compound with chlorid of sodium. And in addition to this, the cryolite not being volatile, easily reducible to the finest powder, free from water, and not attracting moisture from the atmosphere, it presents peculiar advantages in comparison with the forementioned compounds.

I succeeded in fact in obtaining aluminium by heating powdered cryolite with sodium to redness in a small iron crucible much more easily than by a similar treatment of chlorid of aluminium and its compound with chlorid of sodium. The scarcity of the mineral, however, prevented me from continuing my experiments.

A short time since, I returned to them, on having obtained through Mr. Krantz, in Bonn, a considerable quantity of the purest crystals and at a trifling expense, (1 kilogram for 2 Prussian dollars.) But my zeal was exalted by the unexpected news reaching me that cryolite may be obtained here in Berlin and at incredibly low prices.

Mr. Krantz had commuuicated to me his having heard that cryolite exists in masses in commerce, yet he could not learn where. A short time since Mr. Rüdel the superintendent of the chemical manufactory of Mr. Kunheim near the Halle gate, presented to me a specimen of a white coarse powder, large

quantities of which it is said have been sent from Greenland, through Copenhagen to Stattin under the name of mineral soda at three Prussian dollars per cwt. Samples of 40 lbs. had been handed to the soap-manufacturers of this place: and in fact by treating them with burnt lime, a soda-ley was prepared from it, which probably from its very admixture with alumina proved very superior for the manufacture of certain soaps.

I recognised in this powder the mineral *cryolite* of the same purity as the crystals obtained through Mr. Krantz. It dissolved perfectly (in a platinum vessel) and without leaving any insoluble matter in hydrochloric acid; the solution evaporated with sulphuric acid to dryness, showed a deposit, which heated to the expulsion of the free sulphuric acid, proved perfectly soluble in water with the aid of some hydrochloric acid. In the solution, a considerable precipitate of alumina was obtained by ammonia. A filtered solution thereof gave, after evaporation and heating, a deposit of sulphate of soda, which contained no potassium. Besides this, the powder showed the known reactions of fluorine in a very high degree.

This powder is, therefore, cryolite of great purity. Still the coarse powder which I obtained at first, was not the original form in which it comes in commerce. The cryolite arrives here in Berlin in large masses. For the purpose of preparing aluminium it must be reduced, however, to a very fine powder.

In my experiments for the preparation of the metal which I made conjointly with Mr. Weber and with important aid from him, I have used, thus far, for the most part, small iron crucibles $1\frac{3}{4}$ inches high, and $1\frac{3}{8}$ inches diameter, which I had cast in a foundery of this place. In these I stratified the fine cryolite powder with thin layers of sodium, stamped the whole pretty strongly, and covered it with a good cover of chlorid of potassium, and the crucible with a well fitting porcelain cover. Of all the fluxes, I found the chlorid of potassium the most advantageous; it has the least specific gravity, which in view of the very small density of the aluminium is of great consequence. Besides it fuses with the fluorid of sodium to a mass more fusible than the latter alone. I usually employed equal proportions

of chlorid of potassium and of cryolite, and for five parts of the latter I took two parts of sodium. Ten grams of cryolite powder answered the best for the crucible.

The whole was then exposed to a powerful red heat, by means of a blowing apparatus, in which atmospheric air and illuminating gas is forced through pipes constructed after the principle of Daniell's pipe in the explosive gas-blowpipe apparatus. It appeared to be the best to continue the red heat during half an hour and no longer, keeping all the time the crucible carefully closed. Meanwhile the whole is well fused. After cooling, the contents of the crucible are best cleared by means of a chisel, which operation may be facilitated by gentle blows with a hammer on the outside of the crucible. The crucible may be used repeatedly for new operations; though finally it will fall to pieces, in consequence of the blows applied.

The fused mass is treated with water. Usually no gases or only inconsiderable and hardly perceptible quantities of gas are evolved. The small amount of hydrogen given out has the same unpleasant odor as the gas forming during the solution of iron in hydrochloric acid. The carbon comes from the minute portion of naphtha which adheres to the sodium even after drying.

In consequence of the difficult solubility of the fluorid of sodium the fused mass softens but slowly. The addition of chlorid of potassium somewhat increases the solubility. After twelve hours the lumps are softened so much that after pouring away the liquid they may be flattened with a pestle in a porcelain mortar. Larger globules of aluminium are then found, weighing from 1·3 to 0·4 grams, which are separated. I have recently found them of a weight of 0·5 grams. The smaller globules cannot be separated by lixiviation from the alumina simultaneously formed and the cryolite underlying the latter, these being heavier than the aluminium. The whole is treated cold with dilute muriatic acid. This, although it does not separate the calcined alumina, yet gives the aluminium globules their metallic lustre. They are dried, and then the alumina particles and the non-decomposed cryolite powder is separated by rubbing upon silk muslin, the little metallic globules remaining upon the tissue.

The pouring of water over the fused mass is done in platinum or silver cups. Porcelain vessels ought to be avoided, their glazing being attacked strongly by the solution of the fluorid of sodium. The solutions clarified by being left standing in a large silver cup may be evaporated in platinum cups, in order to obtain the fluorid of sodium, which, however, is mixed with a considerable portion of chlorid of potassium.

The small globules of aluminium can be fused together in a small covered porcelain crucible under a cover of chlorid of potassium by means of a blowpipe. Attempts to unite them without the use of the crucible never succeed. The small globules cannot be fused like small globules of silver, because the aluminium, although apparently it does not oxydize while heated with access of air, still it is during that process covered with an almost imperceptible pellicle of oxyd, which prevents the fusion.

The fusion under chlorid of potassium is always attended with a loss of aluminium. A globule of aluminium of 3·85 gr. weight lost by fusion under chlorid of potassium 0·05 gr. The chlorid of potassium after being dissolved in water, did not show any alumina, a small quantity of which, however, separated undissolved. Another part of aluminium unquestionably decomposed the chlorid of potassium ; chlorid of aluminium and of potassium must have volatilized by the fusion. Other metals comport themselves similarly, as copper and even silver.

I followed, therefore, the direction of Déville, and fused the globules of aluminium in a covered porcelain crucible under a cover of chloride of aluminium and sodium. The salt was first fused and then the globules were introduced into the molten salt. In this way the loss of metal is none or very minute, at the most only a few miligrams.

If the aluminium is melted under a cover of chlorid of potassium, its surface is not thoroughly even, but shows minute excavations, which is not the case if it is melted under chlorid of aluminium and sodium.

The quantities of chlorid of aluminium and sodium to be employed for this purpose, are most easily prepared by bringing the mixture of alumina and charcoal in a glass tube of as large

a diameter as possible, and by introducing in it another glass tube open at both ends of a smaller diameter filled with pulverized table-salt. By heating the space containing the mixture of alumina and charcoal very strongly, and that which contains the chlorid of sodium less, while passing the chlorine gas through the tube, the vapors of the chlorid of aluminium will be absorbed so eagerly by the chlorid of sodium, that no chlorid of aluminium or only a trace of it deposits on the other parts of the apparatus. If the smaller glass tube with the chlorid of sodium has been weighed beforehand, the quantity of the chlorid of aluminium it has absorbed can be easily determined. The latter, however, is not combined equally with the chlorid of sodium; that part which was next to the mixture of clay and charcoal, contains the most of it.

I have varied the process for the reduction of aluminium in many ways, but have returned to that described. Often the sodium was placed alone on the bottom of the crucible, over it the cryolite powder, and then the chloride of potassium. In this case, copious vapors of sodium escaped, burning with a strong yellow flame, which did not take place if the sodium was cut in thin slices and stratified with the cryolite powder when the process goes forward very quietly. From the start, the incandescent crucible suddenly glows up vehemently while the decomposition of the compounds takes place. At this point the heat must not be reduced, but kept on, not however beyond half an hour. Through a longer glowing heat, a great loss would be experienced in consequence of the action of the chlorid of potassium upon the aluminium. Neither will the globules of aluminium become larger by a longer glowing heat, which was tried, up to two hours; this effect was produced only through the most intense heat possible. If, however, after the highest incandescence of the crucible, that is, after five or ten minutes, the heating ceases, the gain in aluminium is remarkably small, the metal then not having yet formed in globules, remaining in the form of a powder and burning up during the cooling of the crucible.

No greater gain is obtained if the cryolite powder be first

mixed with a part of the pulverized chlorid of potassium and then stratified with the sliced sodium.

I also tried covering the cryolite stratified with sodium, with a layer of chlorid of aluminium and sodium, and heated the whole as usual. But I found no gain in this way.

I often employed, in place of chlorid of potassium, chlorid of sodium (common table-salt heated) without observing any considerable difference in the result. Only the heat has to be raised higher than when using chlorid of potassium.

The operation may also be performed in hard, fusible unglazed stone-ware crucibles of the same size as the cast iron crucibles aforesaid. At a very high temperature they only resist with more difficulty the action of the fluorid of sodium and melt in one or more places. The iron crucibles melt also, if when filled with the mixture for the preparation of aluminium they are exposed to a very intense charcoal fire.

The amount of aluminium obtained has, up to this time, been very variable, even with the same process and the same proportions of materials. The quantity of metal contained in the cryolite treated has never been reached. The latter contains 13 per cent. of aluminium. By employing 10 grms. of cryolite, a quantity which was the standard in all experiments with the small crucibles, the most favorable product was 0·8 grm. of aluminium. If, however, only 0·6 or even 0·4 grm. were obtained out of the 1·3 grm. which, according to calculation were contained in the cryolite treated, the result would still be called satisfactory. Often only 0·3 grm. and less were obtained.

These so different results depend on various circumstances, principally, however, upon the degree of heating. The greater the heat the more the small globules unite into larger ones, and the less aluminium remains in the state of powder, which could during the subsequent cooling oxydize into alumina. I succeeded sometimes in uniting by fusing in a stone-ware crucible and with a very great heat, almost the whole quantity of the aluminium obtained into one single globule of 0·5 grm. weight.

The heat, which I am enabled to give by means of the blowpipe apparatus, is not equal at all times of the day, depending

as it does upon the varying pressure to which the illuminating gas is subject in the gas metres of the city. But that a great loss of aluminium is caused through a very slow cooling under access of air which favors the oxydation of the small particles of the reduced metals, is proved by the following experiment.

In a large iron crucible 35 grams of cryolite powder were stratified with 14 grams of sliced sodium, and the whole covered with a thick stratum of chlorid of potassium. The crucible covered with a porcelain cap, was placed in a larger earthen-ware crucible, also covered, and exposed during an hour to a good charcoal fire in a well drawing wind furnace, and cooled as slowly as possible. The product in aluminium was in this case remarkably small, only 0·135 gram. in globules being separable from the molten mass.

The varying result originates also in this, that through the varying stratification of the sodium with the cryolite powder, a large amount of the latter often escapes decomposition. The more sodium employed, the less is this the case; but because of the great difference in the price, I never took more than 4 grm. of sodium for 10 grms. of cryolite.

To avoid the loss resulting from the oxydation of the pulverulent aluminium during cooling, I tried some other methods of operation. 20 grms. of cryolite were strongly heated in a gun-barrel exposed to a current of hydrogen, and then the vapors of 8 grms. of sodium passed over it. This was accomplished simply by introducing the sodium placed on a sheet-iron pan in that part of the gun-barrel which stood out of the furnace, and pushing the same in the fire only at the moment when the cryolite powder reached its highest point of incandescence. The operation went on admirably. I permitted the whole to cool in the hydrogen current. After lixiviation in water, in which the fluorid of sodium dissolved with great difficulty, I obtained a great quantity of a black powder, which for the most part consisted of iron, and which in its solution in hydrochloric acid showed but little alumina.

The smallness of the products which I obtained in most instances, must not deter from further investigations. They are

the results of the first experiments in which I have been engaged and for a short time. Now when the cryolite may be obtained at so low a price, and as sodium (for the increased facilities of reducing which we are so much indebted to Déville) will also in future be much cheaper, any one may undertake to produce aluminium, and certainly in no distant time methods will be found that will afford satisfactory results.

Anyhow, I am of the opinion that the cryolite among all the compounds of aluminium will prove the most eligible for the production of aluminium. It possesses so many advantages over the chlorid of aluminium and the chlorid of aluminium and sodium, that it would be employed with the greatest benefit even if its price were considerably higher.

Aluminium has yet hardly been obtained directly from alumina. Potassium and sodium appear to effect the reduction of the metallic oxyds only when the nascent potassium or sodium is at hand to combine with a part of the oxyd not yet reduced. Pure potash and soda, the properties of which are almost unknown to us, do not appear to form at that moment. And as alumina can very readily combine with alkalies to form an aluminate, it should be inferred, that the reduction of alumina through the alkaline metals might succeed in the end.

But even if it should become possible to obtain aluminium directly from alumina, still cryolite may for a long time be employed for the purpose, unless its price should rise immoderately. Nature furnishes this substance in a state of rare purity, the aluminium is combined in it only with fluorine and sodium—two substances which cannot act injuriously during the production of the metal. Clay or aluminous earth is however seldom found in a pure state, and always of great density. To reduce aluminous earth in large quantities from its compounds and to purify it from substances which could act injuriously during the production of aluminium—would be attended with great difficulties.

The globules of aluminium obtained by me are for the most part so extensible, that they may be flattened very considerably and rolled into the thinnest sheets without their showing fissures

on the sides. They have at the same time a strong metallic lustre. On the contrary some few masses, found on the bottom of the crucible and sometimes adhering to it and which had no globular form, showed fissures when rolled, and differed somewhat in color as well as in lustre. They evidently were not as pure as the great majority of the globules, and probably contain some iron.

A large globule of aluminium of 3·8 grm. weight, having been sawn in two, it could be plainly seen that the metal was brittle for about half a line from the outside; but inside it was soft and pliable. Sometimes excavations are found in the interior of the globules.

According to the observations of Déville I happened also to obtain the aluminium in crystalline form. One of the greater globules became in cooling radiated with crystals on its under surface. Déville believes he has obtained regular octahedral crystals, but does not, however, assert this positively. According to the investigations of my brother, the crystalline structure does not appear to belong to the regular system.

Trying to melt a larger globule, accidentally contaminated, after being rolled without flux, before the heat rose so as to melt the whole, small globules went floating on the surface. The impure aluminium is less fusible than the pure which is mixed with it, expands in melting and rises out of the mass not yet fused. It is a phenomenon similar to that observed by Mr. Schneider with impure bismuth.

I have stated that the cryolite has been employed here in Berlin under the name of mineral soda for the preparation of caustic soda-ley, which owing to its aluminous earth appears eminently adapted to the manufacture of soap. In fact the pulverized cryolite is decomposed entirely if boiled in this condition with caustic lime and water. The fluorid of calcium thus generated contains no aluminous earth, this being entirely dissolved in the hydrate of soda, which again is free from fluorine or shows but a trace of it.

Aluminium and Silicium.—The memoir of M. H. Rose on the preparation of aluminium from cryolite has been the means of important improvements in this manufacture. Déville had recognised that with the addition of fluorid of calcium to the bath of the double chlorid of aluminium and sodium, aluminium may be obtained, while it is not possible with the chlorid alone. The fluorids are, therefore, excellent solvents.

A mixture of alumina and fluorid of sodium wet with fluohydric acid may be decomposed by sodium, and aluminium obtained. A mixture of fluorid of potassium and fluorid of sodium is an excellent solvent. It is very fusible and is capable of dissolving much silica, some titanic acid, and a little alumina. This addition of foreign matter even augments the fusibility and renders the fusion as liquid as water. By the aid of the galvanic pile, silicium may be obtained, which forms an alloy with the electrodes unless they are of platinum.

M. Déville has satisfied himself that alumina is not decomposed by sodium, while silica is decomposed. He has even prepared sodium by bringing together capillary glass and sodium in vapor. But the great difficulty in these experiments is in the nature of the vessels used for the experiments and the alterability of the electrodes. For gas carbon is dissolved rapidly in the baths of fluorids when it is used in the preparation of silicium.

Aluminium is manufactured now on quite a large scale at Amfréville near Rouen. The vapors set free in this process are very noxious, as they consist of chlorid of silicium, chlorid of aluminium, chlorid of sulphur and chlorohydric acid. These are disposed of by interposing in their passage a furnace of lime, heated by an adjoining fire, into which, through the draught of the chimney, come the vapors of the reducing process, and also the flame that heats the limestone.—*Am. Jour. of Med. Sci.*

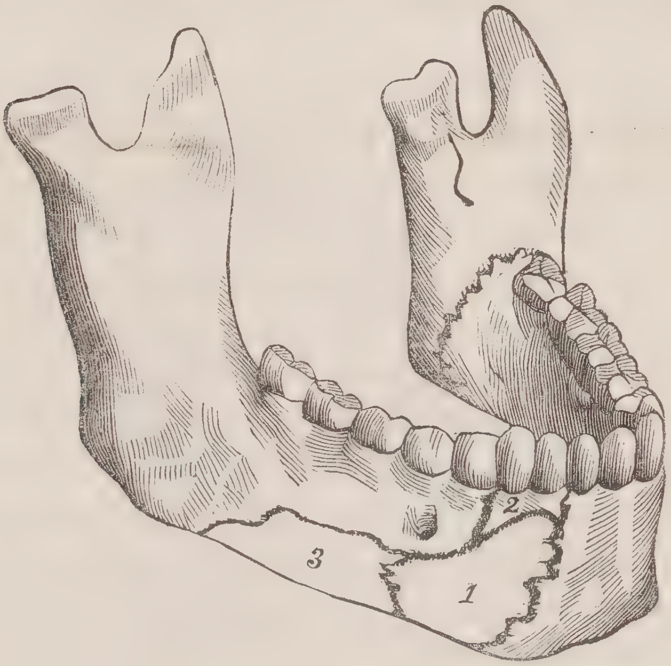
ARTICLE XIV.

Fracture of the Hyoid and Inferior Maxillary Bones, with Fracture and Dislocation of the Thyroid Cartilages, and other Injuries; Tracheotomy, &c.; Recovery. (With three wood-cuts.) By Albert F. Sawyer, M. D., of San Francisco, California.

A vigorous, muscular man, was at work, July 15, 1854, on a piling machine, which was carelessly overturned while he was near the top, and he fell with it to the ground, a distance of forty-five feet. The iron hammer of the machine, weighing one thousand pounds, was at the time elevated, which, of course, precipitated his descent with the most fearful violence. I saw the patient a few minutes after his fall, and, on examination, found that he had received the following injuries: The body of the lower jaw on the right side, near the symphysis, was extensively comminuted; a large triangular fragment of the maxilla was projecting through a lacerated wound of the integument externally and beneath. A piece of bone above, containing the right canine, and adjoining incisor teeth, was lost at the time the accident occurred. The left angle of the jaw was also fractured, but the separation of the fragments was incomplete. (See Fig. 1.) The extensive bruising of the left side of the head and trunk, indicated that the force of the blow had been received on this part of the body, and as far as the maxilla was concerned, was transmitted to the opposite side, were the comminution existed, on the principle of the arch. The face was frightfully distorted, the chin being greatly displaced to the right side. The cartilages of the larynx were fractured and separated, the right over-riding its fellow. On the left side, the great cornu of the os hyoides could be felt loose and detached from the body of the bone. The neck was much infiltrated with air and serum, and subcutaneous

crackling was indicated to the touch over the upper portion of the chest and back. The right radius was broken transversely about three-quarters of an inch above the wrist, the lower fragment being split longitudinally into the cavity of the joint itself. The left patella was much comminuted, the detached fragments of which could be felt and moved about, beneath the integument.

Fig. 1.



The patient was found in a state of great prostration, laboring under the usual signs of concussion of the brain. He could be partially aroused by loud shouting in his ear, or on manipulation about the fractures. Pupils dilated, sluggish to the stimulus of light; respiration slow and measured, without noise; skin bathed with a cold moisture; pulse feeble, cannot be counted. I had him well covered with blankets, external heat constantly applied, and diffusable stimulants, as brandy and ammonia, administered *pro re nata.*

Fig. 1. The Jaw Restored.—1. The large fragment removed at the time of the accident. 2. The piece containing the canine and incisor teeth. 3. The exfoliation subsequently removed; several smaller exfoliations were also at different times extracted from the wound.

In the course of two hours reaction began to be established, when the patient was transferred to a comfortable bed, and his fractures dressed. Several loose fragments of the maxilla were removed through the external wound, the edges of which were afterwards brought together, close dressings applied, and retained in place by a figure of 8 bandage over the cranium. The fracture of the radius was treated with simple splints; the left lower extremity was flexed on the pelvis, at an angle of thirty degrees, and supported in this position by an inclined plane.

Stimulants ordered through the night, and evaporating lotions for the neck, knee-joint, and the various ecchymosed portions of the body.

July 16. Passed a restless night; at times delirious, and inclined to strip off his dressings, followed by periods of heavy slumber; now, when aroused, talks incoherently; surface of the body cool; pupils unequal; head flushed; passes his urine copiously in bed; pulse 110, soft and feeble. Ordered black draught internally, to be followed by a turpentine enema; ice to the head, and blisters to the inner aspect of the thighs.

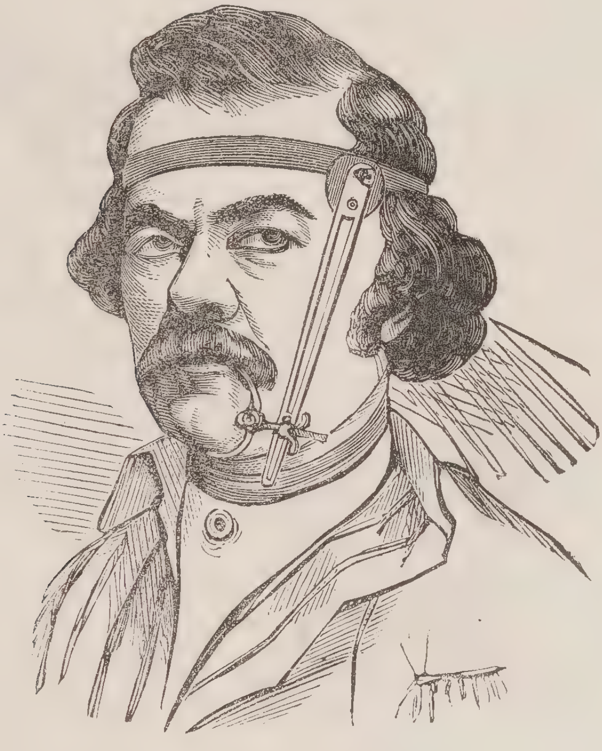
17*th*. General symptoms of traumatic delirium; respiration inclined to be stridulous; voice husky, and deglutition extremely difficult; bowels well evacuated by medicine; extremities quite cold. Repeat the stimulating enema; mustard to the extremities; injections of warm beef-tea.

18*th*. Patient passed a more quiet night; less congestion of the head; skin moist and warm. He appears rational this A. M., although evincing great prostration physically; wound of the jaw suppurating; patient swallows with more ease; pulse 96, full and soft.

19*th*. Rested well during the night; takes beef-tea by the mouth without difficulty, and with a relish; respiration and voice unchanged; effusion into the knee-joint subsiding. The joint is without much heat or tenderness, and patient makes no complaint of it. Great difficulty is experienced in keeping the fragments of the jaw in coaptation, on account of the comminution of the bone, with its loss of substance, and the frequent

change of dressings rendered necessary by the profuse purulent discharge. A mould of the outline of the jaw externally was taken in plaster, and of the alveolar margin of the jaw with wax. Thin metallic plates were struck up from these moulds, which were accurately adjusted to the maxilla, the external one being cut away, at the site of the wound, to allow of the free escape of the pus. The lower jaw was then brought firmly against the upper, and made secure by appropriate dressings. (See Figs. 2 and 3.) The patient has some febrile dis-

Fig. 3.



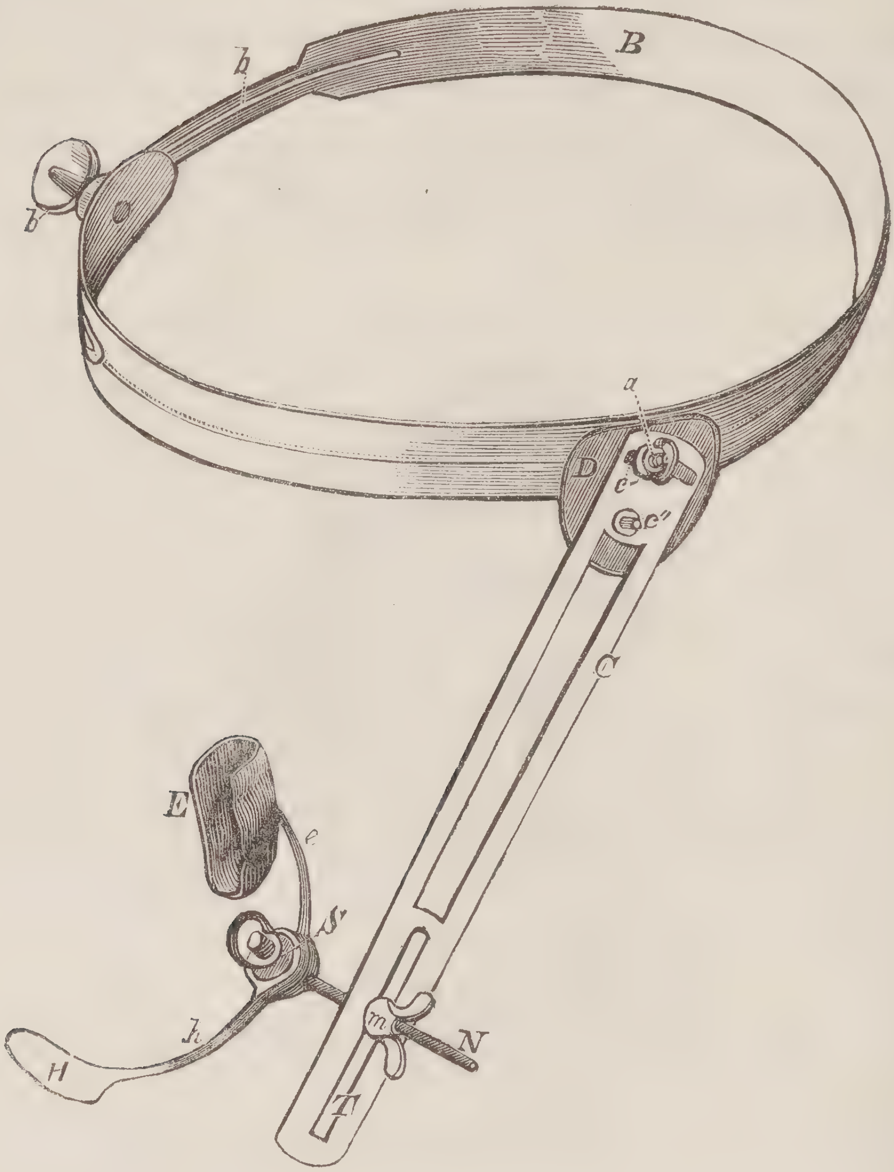
The Apparatus Applied.

turbance; tongue marked with a white dry centre; pulse 96, with a stong impulse; ordered gruel. ℞.—Infus. sennæ ℥ iv; sulph. magnes. ℥ ss. M. ft. haustus. Pul. Doveri grs. x. Hora somni sumend.

20*th*, 8 A. M. Respiration was somewhat embarrassed during the night; now, however, less dyspnœa than during previous twelve hours; breathing apparently goes on without serious effort. Tumefaction of neck was much increased; swallows

without pain, and craves food; tongue moist; skin of natural temperature; pulse 90, soft and full. Ordered hirud. vj to be

Fig. 3.



Apparatus Separate.—*B*, a thin ribbon of steel, $1\frac{1}{4}$ inches in width, and long enough to encircle the cranium, covered with chamois skin, with a permanent screw attached to one extremity, playing in the fenestrum *b*, to enable it to be accurately fitted and retained in place by the female screw *b'*. *C* is a thin plate of steel, 6 inches in length, $1\frac{1}{4}$ in width, gently tapering towards the free extremity, and stiffened by a second narrow plate, which is riveted to the first. At *c'* is a fenestrum describing the arc of a circle. This plate is attached to the ear-piece *D* of the strap at the pivot *c''*. It can be moved forward and backward within the limits of the fenestrum, and fixed at any point by the thumbscrew *d*. *E* is a thin silver cap, closing over the molar teeth and

applied on each side of the neck, to be followed by fomentations of hot water and spirit.

2 P. M. It was reported to me that the breathing of the patient had become extremely labored. On arrival I found him in the last stages of asphyxia; countenance purple; eyeballs projecting; veins turgid, like whipcords; inarticulate; nearly insensible; respiration not more than three or four times a minute, and patient evidently in his death throes. Without loss of time the head was thrown backwards, to expose the anterior cervical region; an incision was made downward along the median line of the larynx about two inches in length, with the intention of opening the crico-thyroid membrane. The serious injuries inflicted on the laryngeal textures, as revealed in the progress of the dissection, convinced me that laryngotomy could not be safely relied upon. The original incision was continued along the median line of the neck to the top of the sternum, the trachea soon exposed, and the fourth and fifth rings divided by a longitudinal cut. The trachea occupied a deep and formidable position, as the patient had a thick muscular neck, which was also enormously tumefied as far as the thorax, from the effusion of serum, and the escape of air from the fractured larynx into the inter-muscular cellular tissue.

alveolar process of the jaw, made from a mould of the parts previously taken in wax. *H* is a hard pad, covered with chamois skin, and shaped to grasp the jaw externally and underneath. These are connected together by two covered steel bows, *e* and *h*, at the hinge-joint *s*. To *h* is attached a long male screw *N*, playing upward or downward, forward or backward, in the fenestrum *T* of the perpendicular plate, and fixed in any position by a nut *s'* and thumbscrew *m*. The entire weight of the apparatus is ℥ viiss. To apply the apparatus, the head-strap is first fitted, and confined by turning the thumbscrew *b'*, as in Fig. 2. The plate *C* is then swung forward on the pivot *c''*, to bring the fenestrum *T* opposite the angle of the mouth, and fixed by the thumbscrew *d*. The silver cap is fitted over the alveolar margin of the jaw, and the pad adapted inferiorly—the arches *e* and *h* brought together at the joint *s*, their curves just avoiding the integuments of the jaw, and fixed by a thumbscrew. This portion of the apparatus embraces the jaw in a firm grasp. The jaw is then restored to its natural position by drawing it forward and outward, when the long screw *N*, attached to the joint *s*, is inserted into the fenestrum *T*, and fixed there by tightening the thumbscrew *m* upon the nut *s*, the reverse side of the plate.

The patient had ceased to breathe before the trachea was opened. The abundant venous hemorrhage gave considerable annoyance, and I was left entirely without assistance, the nurses being occupied in controlling the wild excitement of a brother of the patient, who, not understanding the purport of the operation, had violently attempted to interfere with it. A quill, which was fortunately at hand, was passed into the trachea. The lungs were then inflated by applying the mouth to the quill, and the wound stuffed with sponge to restrain the oozing. By alternating the inflation by pressure and friction over the chest, by the use of the cold douche, &c., soon satisfactory indications of returning animation and consciousness were obtained. On the first respiratory efforts the quill was removed, and the edges of the tracheal aperture kept asunder as widely as possible, to allow a more perfect ingress and egress of air. A tracheotomy tube was inserted into the trachea as soon as obtained, and tranquil breathing finally restored. About ℥ ss of coagulum and mucus was expelled through the wound and tube. After all hemorrhage had ceased, the upper part of the wound was brought together with the interrupted suture, and the patient left in a comfortable condition. 9 P. M. Respiration free through the tube; patient makes no complaint; chicken tea allowed. ℞.—Spts. nit. eth. ʒj; tr. opii gtt. x; mist. camph. ℥ ss. Hora quaque capiat donec somnis fuerit.

21*st.* Patient slept quietly during the latter part of the night; less tumefaction of the neck; respiration goes on entirely through the tube and the wound. Ordered beef tea and porter, mucilaginous drinks. ℞.—Sul. morph. gr. $\frac{1}{5}$; mist. camph. ℥ ss. Hora decubitus.

24*th.* Swelling of neck rapidly passing away; a deep-seated hardness about the larynx and upper portion of the trachea, resulting from the deposit of lymph. Patient has much improved in strength; increased inflammatory excitement about the jaw, without active constitutional symptoms; a clear mucous expectoration through the tube without effort. The dysphagia resulting from the operation has nearly subsided; pulse 85, soft and regular. Ordered a simple enema; asks for and may have the yelk of an egg, and calves' foot jelly.

28th. Complains of pains—not constant—at base of lungs; sonorous râles over right anterior chest; cough dry; expectoration thick, viscid, and diminished in amount; subcutaneous emphysema has disappeared; wound of the neck rapidly contracting; tongue covered with a moist gray coat; skin natural; bowels confined; pulse 80, strong and full. A small slough has separated over the fractured patella—disclosing a minute orifice of the size of a probe—evidently communicating with the cavity of the joint, and from which a few drops of synovial fluid has escaped, transforming a simple into a compound fracture. The effusion attending the primary injury has become apparently absorbed, and the joint nearly resembles its fellow. The opening was immediately covered with scraped lint and adhesive strap, and a roller applied from the foot to the groin.

Ordered gruel; black draught ℥ij. ℞.—Pul. opii c. gr. x; hora somni. ℞.—Syr. ipec. ʒi; syr. tolut. ʒiij; acid. hydrocyanic. D. gtt. i, *pro re nata*, sum.

30th. Thoracic symptoms relieved; and abundant frothy mucus expelled through the tube; patient complains of a dull ache in the knee joint; dressings removed; some increase of fullness found with tenderness on pressure; external redness and heat; slight synovial discharge from the wound; pain in head; thirst; pulse 80, bounding. ℞.—Hirud. xij around patella, to be followed by warm fomentations. ℞.—Nit. potass. gr. v; tart. antim. et potass. gr. i; sulph. morph. gr. $\frac{1}{8}$ in quaq. tert. hor. sum.

31st. General febrile disturbance; knee-joint much swollen; an abundant sero-purulent discharge from the wound; rest much broken on account of pain; bowels freely opened; pulse 86, hard. Apply hirud. vj above and below the joint. ℞.—Pulv. Doveri gr. xv. Hora somni sum.

August 1. Less constitutional irritation; knee the same with sanious discharge. Patient rested tolerably through the night. Repeat opiate.

3d. Patient makes no complaint; tongue covered with a moist white coat, clean at edges; skin natural; asks for food; pulse 80; a healthy purulent discharge from the joint. An

incision was made over inner tuberosity of tibia, and about ℥j of laudable pus evacuated. Beef-tea ordered.

5th. 3 A. M. Was informed that the patient was bleeding profusely from the jaw. Instructed the messenger how to make compression on the facial arteries, until I should be able to reach the patient. On my arrival, soon after, I found the patient exsanguine; the skin bathed with a cold moisture. The pulse could scarcely be felt at the wrist. The compression above directed had had the desired effect, and, whilst continued, had perfectly controlled the hemorrhage; on relaxing it, the bleeding was renewed again, evidently poured out from some of the branches of the right facial artery. I cut down upon the facial of this side where it turns over the margin of the jaw, placed a ligature upon it, and the hemorrhage was at once arrested. Ordered bottles of hot water externally; may have hot milk punch *ad libitum.* 4 P. M. A good reaction established; no further hemorrhage. Patient takes nourishment freely; pulse 110. The large coagulum, projecting from the wound externally and internally into the mouth, was carefully removed. The wound has a dry, glazed appearance. Continue stimulants.

6th. Patient had a refreshing sleep during the night; considerable swelling over the right side of the jaw, the integument being tense, reddened, and glistening; no suppuration from the jaw; increased vascular excitement about the knee, with a very profuse escape of sanguineous pus from the opening over the patella. Patient has a hoarse dry cough with difficult expectoration; skin of natural temperature, but dry; has a decided appetite; tongue moist; pulse 90, rather sharp. Ordered beef-tea. ℞.—Ol. ricini ℥i; ℞.—Syr. scillæ, syr. ipec., āā ʒss; muc. acac. ℥ss *pro re nata.* ℞.—Pulv. Doveri gr. x. Hor. somn. cap.

9th. Patient is mending; wound of the neck rapidly granulating about the tube; less tumefaction of jaw, and suppuration is again established. Left lower limb is much distended with serum above and below the knee. The joint is tender on pressure, but does not give patient much pain.

12th. Incision made over outer tuberosity of tibia and about ℥ ij of healthy pus evacuated. Patient allowed a free diet. ℞.—Tr. cinchon. c. ʒ j; ter in die. Excoriations complained of over the sacrum. Circular air-pillow (caoutchouc life preserver) applied with perfect relief to the patient.

30th. A free discharge of pus from wound made to ligate the facial artery; no febrile movement; appetite and digestion good, and the patient is in excellent spirits; pulse 80, of good volume. Fracture of radius examined this A. M. The fragments are found in good position, but only feeble efforts at repair are indicated. Dressings renewed.

September 6. An ill-defined tumor of the thigh is observed most prominent at middle of vastus externus muscle; no fluctuation; suppuration has nearly ceased at the knee. Patient has lost all desire for food; nervous system is much depressed; skin hot, dry and harsh to the touch; bowels torpid; tongue marked with a brownish, dry coat; pulse 86, feeble. An incision was cautiously made over the prominent part of the swelling through the extensor muscle, which opened into the cavity of an abscess, evidently communicating with the joint. About ℥ iv of laudable pus escaped. A pledget of lint was passed into the wound to prevent the edges from uniting. Since all close dressings on the maxilla were necessarily abandoned after ligature of the artery, the fragments have continued displaced, the chin falling over to the right side, and by their constant irritation were evidently keeping up the suppuration. The probe passed into the wound made to ligate the artery meets with denuded bone, which is undetached and extends towards the place of the fracture. The apparatus figured here (see Figs. 2 and 3,) was contrived to correct this displacement, at the same time not to interfere with the free discharge of matter. The principle consists in presenting an antagonistic force to the powerful muscles attached to the main body of the maxilla, especially those at and near the symphysis, which were retracting it, and acting forcibly on the free extremity of the bone, were dragging it to the opposite side. The short fragment was depressed by the mylo-hyoideus, and overlapped the

body of the bone. The fracture at the left angle has become perfectly consolidated. ℞.—Sulph. quin. gr. ij. In quart. hora qua. sum.

13*th.* Patient is much emaciated; general cachexia of the system; complains of pain in the abdomen; abdomen tympanitic; tenderness over the sigmoidfle xure; nervous system irritable; pulse 86, small and sharp. Patient can now wear the fracture apparatus day and night, which could be endured at first only a few minutes at a time. The fragments are retained in the most perfect position by it; and the natural contour of the face restored. The bowels are inclined to be relaxed; continue quinine; apply to abdomen turpentine stupes. ℞.—Tr. opii gtt. xv; eth. chlo. ʒ ss; ol. terebinth. gtt. vj; syr. zinziber. ℥ ss, in quaque hor. repitend donec somn. 2 P. M. Patient has had three hours of refreshing sleep; reports himself as more comfortable; abdominal symptoms much relieved; pulse the same.

16*th.* Typhoid tendencies yielding; all functions of the body well performed; great discharge of healthy pus from the opening at the middle of the thigh, which seems to be the principal outlet for the accumulation within the cavity of the joint. The jaw splint has greatly soothed the irritation resulting from the irregular movements of the fractured bone in the surrounding textures. Suppuration has much diminished; continue quinine; may have a liberal diet with wine.

October 17. Patient is slowly convalescing; is kept debilitated from the constant suppuration connected with the knee-joint, on either side of which, occasionally, superficial deposits of pus are evacuated; he has a good appetite; sleep is uninterrupted, and he is free from all fever; circular air-pillows are found of great service in preventing sloughs, where the bony prominences of the body, which is much emaciated, come in contact with the bed; on examination of the fractured radius, firm union was found to have taken place; and all dressings were removed.

November 25. General condition of the patient the same as at last report. The wound of the neck has nearly closed

around the tube, through which respiration goes on with entire freedom; the tumefaction of the thigh, and the excitement in knee-joint is gradually yielding; the leg was bent at a small angle on the thigh to rest in a favorable position for anchylosis. An incision was made from near the angle of the jaw forward, connecting the two fistulous openings; the edges of the incision dissected up to expose the lower margin and body of the jaw, and a large exfoliation, and several smaller pieces of bone removed. Edges of wound connected by the interrupted suture. Water-dressings.

January 2. Patient has been gaining daily in flesh and strength; is now exhibiting malarious symptoms, undoubtedly owing to the locality where he is residing; he is now so far improved as to justify a removal to a more elevated and healthful location; wound of the jaw has entirely cicatrized; the knee is fast resuming a natural appearance; manipulation of the limb, as in changing the dressings, causes only trifling uneasiness. During the twenty-four hours, about ℥j of pus finds its way from the opening in the thigh. Ordered low diet. ℞.—Quin. sul. gr. v; quart quaque hor. sum. ℞.—Pil. hyd. No. iij; hor. som. ℞.—Tr. rhei ℥ss; mane primo sumat.

10*th*. Only a small escape of thin serous pus from the knee; the splint removed this A. M., and the limb allowed to rest on a pillow.

14*th*. The patient having so far recovered as to allow of operative proceedings on the larynx, with a view to a restoration of the natural air-passage, and the permanent closure of the aperture in the trachea, sulphuric ether was administered to him by saturating a sponge, and placing it over the silver tube in the trachea, through which inhalation went on without embarrassment. After complete anæsthesia had been produced, an incision was made through the integument, along the median line of the neck, from the hyoid bone to the tracheal orifice. The tracheal tube was withdrawn a short distance, and supported by an assistant, to prevent the hemorrhage passing through it into the windpipe. The subjacent tissues on either

side of the median line were then dissected up, leaving the free margin of the right thyroid cartilage exposed in its entire length, which was found to be displaced, and widely overlapping its fellow. The anatomical relations of the parts were much obscured from the injury primarily, and from the induration following the inflammatory action excited by it. The edges of the wound were lifted up, and the interval between the cartilages separated as well as possible without opening into the cavity of the larynx. After a pause of about an hour, to allow of the complete arrest of the hemorrhage, which had been very profuse, and principally venous, the final steps of the operation were completed. The crico-thyroid membrane was opened with a sharp-pointed bistoury. Into the wound thus made, a strong probe-pointed bistoury was inserted, and an attempt made to separate the thyroid cartilages their entire length. An unexpected difficulty presented itself, for there was found to be an extensive ossific deposit between them which required considerable force to overcome. At this period the condition of the patient became critical. The bleeding had been very free, and from the delay occasioned by the presence of the bony deposit, a large amount of blood had escaped into the air-passage, and the patient began to show alarming symptoms of strangulation. With the handle of the scalpel I succeeded in separating the cartilages wide enough to introduce a piece of sponge, which prevented any further flow of blood. By the application of stimulants, &c., a free expectoration of coagula took place through the tube, and soon the patient began to respire more freely. After a short interval the sponge was removed, and the bleeding found to be perfectly arrested. It had been originally intended to separate the left thyroid cartilage from such adhesions as might be found, turn it back upon itself, elevate it, and unite the two at their free margins. This was found to be impracticable, for the bony deposit had gone on to such an extent that the cartilage was extremely firm and unyielding. It had apparently been fractured and bent upon itself, and occupied the cavity of the larynx. It was still further bound down by the almost cartilaginous hard-

ness of the adjoining textures. All attempts at examination of the larynx with bougies, &c., were attended with violent paroxysmal cough and vomiting, which, in the present weakened condition of the patient, forbade as detailed an examination as could have been desired. The tracheotomy tube was inserted about midway between the division of the cartilages, in order to have its dilating influences on the depressed left thyroid. To accomplish this, it was necessary to drop the hand until the overlapping interval was passed, and then to forcibly carry the tube around the edge of the left thyroid, raising the hand toward the median line of the neck, and pressing the tube downward. The tube was inserted at this position to exercise a lever power on the depressed cartilage. The patient respires with ease through the tube. As every effort at cough provokes hemorrhage, the wound was stuffed with sponge; about the tube cold-water dressings applied; milk-punch *ad libitum.* 10, P. M. Reaction well established; neck much swollen; cheeks flushed; complains of excessive weakness, and pain in deglutition; pulse 120, of good volume. The sponge removed from the wound. Ordered gruel, and pulv. Doveri grs. xv.

15*th.* Strong sympathetic fever; neck much tumefied from violence of inflammatory action about the wound; extreme dysphagia; tongue dry; pulse 96, hard. Apply hirud. vj to neck; an enema of senna. ℞.—Pulv. Doveri grs. xij; hora somni.

17*th.* Patient is very comfortable; active interference with the larynx is attended with severe paroxysms of vomiting and coughing. Tube removed from the larynx, and a wedge-shaped piece of prepared sponge is inserted into the wound to prevent adhesion, and to promote its dilatation. A tube has been worn in the tracheal orifice since the operation to guard against accident. Patient swallows without pain; craves food; pulse 86, full and soft. Porter allowed, with generous diet. The wound of the larynx is kept well dilated by the use of the sponge tent. Bougies are daily passed downwards through the larynx into the trachea, and upwards into the posterior fauces. No. 6 can now be used without much difficulty. These con-

stantly provoke violent retching and vomiting, which severely tax the patient for the time being. A tube is inserted here morning and evening, on a small sized bougie as a guide, between the vocal chords, and retained for an hour. But the patient loses all power of articulation when the tube is in place. Respiration goes on easily through it. A gutta percha plug of the size and form of the tracheal tube is preserved in the tracheal orifice, while the tube is in its new position.

February 27. Patient is rapidly recovering his health. He can now bear considerable weight on his left limb; knee-joint apparently firm and solid; a few drops of serum only discharged from the fistulous opening. No attempt at union has been made at the fractured jaw. The various textures are, however, firmly consolidated about the fracture, and the patient exhibits no external deformity. Dilating measures still pursued at the larynx. Bougie No. 9 is easily passed in either direction. Respiration goes on as comfortably through laryngeal as through tracheal tube.

March 31. Gutta percha bougies of large size, and fashioned for the purpose, worn as much as possible during the day. The wound has a strong disposition to contract. The sponge-tent still worn during the night. Notwithstanding the use of astringents and caustics on the mucous surface of the larynx, there is still a troublesome irritability attending every interference with it. The bougies can be worn for about two hours, when the patient suffers from a severe pain in the temples, and at right angle of jaw, which soon becomes insupportable. Cheeks are flushed; conjunctivæ suffused; nausea and vomiting follow compelling the removal of the bougie.

May 27. Wound of the larynx has now united, except at orifice where the bougies find entrance. Notwithstanding the successful dilatation of the larynx to an extent to allow a sufficient amount of air to pass by the natural passage, and to admit of a free respiration through it, yet every attempt to encourage the air to take this direction has failed. On removal of the tubes, and closure of the orifices, no air can be detected from the mouth. Symptoms of suffocation ensue, requiring the

speedy renewal of the tube. In articulation, the diaphragm and thoracic muscles are greatly exerted to insure the production of sound—the patient grunting out his words, as it were, without much distinctness, and in a hoarse whisper. Every expedient having been exhausted in the attempt to restore natural respiration, and as it appeared that nothing further could be accomplished to promote this desirable end, it was determined, after consultation, to close the laryngeal opening, and allow the respiration to continue through the artificial opening in the trachea; firstly, because the tube was worn with less discomfort to the patient in this position than in the larynx; secondly, because the patient could make no articulate sound from the upper opening, probably on account of the interference of the tube with the vocal cords; thirdly, because it was not improbable that there might be troublesome contraction of the trachea during the healing process, especially as the wound has been open for so long a period.

July 1. General health of the patient is now fully restored. Knee-joint is firmly anchylosed, and patient can walk about without other inconvenience than results from a stiff limb. Respiration goes on entirely through the tracheal tube. The opening in the larynx had a tendency to become fistulous, but on the application of caustic it soon closed by granulation. There has been no attempt at union in the fractured jaw. Patient can masticate his food well, and the face is free from all deformity. Medical attendance is now discontinued.

Remarks.—This case affords an example of the wonderful tenacity of the vital principle, sometimes manifested. At the time of the accident, the severity and complication of the patient's injuries forbade any rational idea of his recovery. For the first few days a liberal exhibition of stimulants was required to overcome the severe prostration resulting from the shock to his entire system, occasioned by the fall. There were no evidences of marked inflammatory excitement until the 20th, five days after his fall, and then his symptoms were of an asthenic character, requiring the utmost caution in the use of depletives. On the morning of the 20th, it was seriously contemplated to

cut down upon the larynx, but as the patient appeared to respire with sufficient freedom, the idea was dismissed for the time being, and when called upon to operate in the afternoon, the urgency was such as to forbid any elaborate attempt, by a careful dissection, to restore the larynx to its normal condition. The fracture of the tongue bone is a rare accident. I have been unable to find an instance of it, from such sources as I could examine here, unless connected with violent strangulation from a force applied directly to the bone itself. So large a portion of the jaw was lost by fracture, and subsequent exfoliation, that a bony union of the remaining fragments could not be expected. The first apparatus afforded an excellent dressing, and simple fracture of the jaw can be treated by it with advantage. The articulation of the jaw allows such a variety of movement, that it is impossible to apply a bandage to insure perfect immobility. A roller cannot be applied to the healthy jaw, so that the mouth cannot be opened half an inch. Still, sufficient support is given to the fragments to answer in most cases of simple fracture. All that was expected from the jaw-splint afterward contrived was obtained, thereby restoring the contour of the face; quieting the irritation in the surrounding textures from the unrestrained and irregular movements of the bone when acted upon by the muscles attached to them; insuring, as perfectly as possible, their retention in a natural position after nature had completed her reparative efforts by a consolidation of the soft parts about them. I can conceive of no case of fracture of the jaw where there is displacement sufficient to require mechanical support, and especially in compound fractures attended with suppuration, where this splint, or modifications of it to suit special indications, cannot answer all that is required of a splint, at the same time promoting the comfort of the patient; as in this instance the patient, after becoming accustomed to the splint, found it impossible to sleep without it. The silver cap covering the alveolar margin must necessarily be fitted to each particular case; and oftentimes it might be necessary to duplicate the perpendicular plate, for the opposite side, to exercise a retentive force on both fragments.

The fracture of the patella was an interesting feature in this case. It was remarkable that this bone should have been so comminuted without fracture of the long bones entering into the articulation of the knee-joint. The irritation attending the original fracture was so trifling, that there was every indication that the joint would be preserved with a tolerable degree of integrity. About a fortnight after the accident, when the joint had resumed its natural appearance, the separation of a slough, which appeared to be superficial only, opened into the cavity of the joint, and inflammatory symptoms were kindled up, which for weeks threatened the loss of the limb. The exhaustion produced by the constant drain on his system from this source, kept the patient so weakened that nearly six months elapsed before there could be any justifiable attempt to restore the natural air-passage. In operating upon the larynx, it will be observed that sulphuric ether was the agent employed. The inhalation went on without embarrassment to the patient, without exciting cough or sense of strangulation, or stimulating the nervous system, as is not unfrequently the case where anæsthetics are administered under a more favorable combination of circumstances.

Of the anæsthetics, chloroform, chloric ether, and sulphuric ether, the two former—especially chloroform, which is in the most common use—have now a long array of fatal cases attending their exhibition. We believe there is not a single well-attested case on record of fatality from the inhalation of sulphuric ether. This statement is often challenged, but the contradiction really arises from the careless reports of mortality, often in newspapers or otherwise brought before the public, where the general term of ether is used indefinitely for all anæsthetic agents, and the word "etherized" is made synonymous with anæsthesia, or the effects of any of them. This is certainly an important fact for the consideration of medical men, especially since accidents from the inhalation of chloroform have become so accumulated that the propriety of its administration, unless in the most urgent cases, is becoming seriously questioned. Thence, also, the growing substitution of freezing mixtures, as

recommended by Arnott, for producing insensibility to pain, in operations involving superficial parts; which, when carried to a sufficient extent to benumb the textures to be incised, from its likelihood to produce sloughs, or suppurating wounds, cannot be esteemed a sound surgical procedure.

There is no doubt that sulphuric ether may produce death, but this is not so likely to happen where an agent is employed which is, as experience demonstrates, more under the control of the surgeon, and less hazardous to the patient. Its perfect safety, with ordinary care, is proved from the circumstance that, although in extensive use in different parts of the country from the date of its application for anæsthetic purposes, yet no mortality has occurred from it. Any one who has been in the habit of seeing both agents administered, chloroform and sulphuric ether—and chloric ether may be regarded as equally dangerous with the former—will be struck with the immediate depression attending the exhibition of chloroform. At the same time, it acts so gently and insidiously that frequently no warning is given of the escape from the waking into the sleeping condition. With sulphuric ether, on the other hand, the various stages of its action on the human body are prolonged, and can be accurately limited by the most inattentive observer; and the period of excitement always discernible, and often violent, immediately preceding the stertor of insensibility, is of great value to the surgeon, as indicative of the actual condition of his patient. Notwithstanding that accidents have so frequently attended the use of chloroform, and very often so in the hands of the most cautious and skillful practitioners, medical men often justify their preference for, and their fancied security in, the administration of it, for the reason that they have never experienced any unfortunate result. But the repeated cases of death from this source in the practice of men as enlightened as themselves in the administration of it, must necessarily awaken doubts in the minds of those who continue to use it, whether they are not constantly exposed to the same mishap. A large number of the fatal instances have occurred in the practice of dentistry. It can be urged that the want of familiarity of dentists with chlo-

roform renders them unsuitable persons to administer it. The objection, however, loses its force when it is considered that the dentist knows as well as the physician the dangerous properties of chloroform; that he applies it sufficiently often to become familiar with the proper mode of administering it—and that he does not require, neither does he seek to produce that state of complete anæsthesia necessary to be secured in order to perform an elaborate dissection, proceeding with his operation when the patient is sensible of what is transpiring.

The common opinion that their employment is made hazardous in every derangement of the thoracic viscera, is certainly a mistaken one. Not only in our own practice, but in the practice of others, a free inhalation of sulphuric ether is often allowed in organic disease of the heart, as an alleviator to pain, and a sedative to produce rest. In inflammatory disorders of the chest, where the powers of life are failing, and stimulants are required, we believe it can be safely made use of, if any necessity arises demanding its quieting effects. Thus, we had a short time since a patient who had a severe attack of pneumonia in both lungs. He was sinkin grapidly with symptoms of typhoid; at times he was quite delirious, and his expectoration was decidedly purulent. He finally was seized with an obstinate hiccough, which continued without interruption for two days, and resisted the usual antispasmodics employed to relieve him. Convinced that his case could not be made more desperate, I determined, after consultation, to administer to him sulphuric ether. After a few inhalations, the hiccough was interrupted, and the patient fell into a gentle slumber, which continued for a considerable interval. From this time he began to improve. He had two or three attacks subsequently, which yielded as readily as before on the application of the remedy.

Mr. Syme, of Edinburgh, in the March number of the *Lancet*, makes some very judicious remarks regarding the exhibition of chloroform, in which he points out the necessity of regarding rather the condition of the respiration than of the circulatory system; to learn the actual condition of the patient during the inhalations. Cases are well known where the inhalation has

been suspended, the circulation appearing sufficiently vigorous, and the surgeon engaged in his operation, when, to his dismay, he has found his patient in a state of collapse, from which he was with difficulty, or never restored. The fancied superiority of chloroform over sulphuric ether, has come from a belief that it is more prompt in its action, less disagreeable to the patient to inhale, without the unpleasant consequences sometimes attending the inhalation of sulphuric ether; while it is generally believed, also, that the life of the patient is equally hazarded where either agent is used. Sulphuric ether is often intensely disagreeable to the patient, and sometimes—especially if the will is antagonistic—produces a sense of strangulation which arrests or delays temporarily the respiration, and affords alarm to the attendants. There is no real danger in this asphyxia, and, in most instances, the ether can be continued regardless of it without compromising the condition of the patient. The happy effects of sulphuric ether were well illustrated in the operation on the larynx. Just previous to the final step of the dissection, the patient was placed thoroughly under the influence of it. The laryngeal cartilages were then separated, which was attended with considerable hemorrhage, a portion of which found its way into the bronchia. I had some anxiety lest the exclusion of air from the lungs by the hemorrhage would produce a fatal asphyxia, or immediate suspension of respiration in the insensible state in which he was lying—as I firmly believe would have been the case had chloroform been the anæsthetic used.

The excitement of the nervous system attending the inhalation of sulphuric ether, if any exists, can be easily restrained by attendants, and the ether continued without regard to it. In such cases, the insensibility proceeds more rapidly as the physical efforts of the patient, in his struggles, compel a full, deep, and rapid respiration. The after effects, as nausea, headache, &c., are not more common than the like results of chloroform, or chloric ether. A difference of a minute or two in time in producing anæsthesia, is a matter of very little consequence. With a pure article of concentrated sulphuric ether, I have invariably succeeded within two or three minutes from the time

the sponge was first applied. The ordinary commercial ether is certain in its results; but a little more delay is required to produce the end desired. It has been proved by experience, that up to this time no agent has been discovered for anæsthetic purposes that can be administered with equal security for the patient. In short, it produces perfect insensibility to pain, and never has destroyed life. The trifling objections that may be urged against it fall in comparison with this important consideration; and we believe the day is not remote when we shall see it exclusively used by surgeons for anæsthetic purposes.—*Amer. Jour. of Med. Sci.*

ARTICLE XV.

Deep Wound of the Parotid Region, in which a Ligature was simultaneously applied to the Common and Internal Carotid Arteries. DR. GURDON BUCK records (*New York Medical Times*, Nov. 1855,) the following interesting example of this.

"WILLIAM GRAW, aged 30, was admitted into the New York Hospital, July 5, 1848, with a deep wound in the right parotid region, caused the day before by the explosion of a glass bottle containing gunpowder. The hemorrhage, which was profuse, was arrested with much difficulty by sewing up tightly the external wound, after first extracting a fragment of glass one inch in length. The upper part of the neck and cheek, surrounding the wound, were a good deal swollen and tense. The wound itself was scarcely half an inch in length, and was situated half an inch anterior to the lobe of the ear. After enlarging its orifice, the finger passed directly inwards behind the ramus of the jaw, a depth of nearly two inches, and could be moved about with some freedom at the bottom of the wound. No hemorrhage followed the exploration. The patient's mouth was drawn towards the left side, and much distorted. Deglutition was dif-

ficult, and his voice, hitherto distinct, was thick and not easily understood. Patient was directed to keep in bed, and to have cold water dressings applied to the part.

"*July* 8. On careful examination, the swelling, which had increased, presented a distinct pulsation at its central and most prominent part, showing conclusively the development of a false aneurism.

"*9th.* At 4, A. M., a very profuse hemorrhage occurred, which could not be controlled by pressure over the wound, but was finally arrested by very firm compression applied to the common carotid. After being kept up by the resident surgeon and his assistants for nearly two hours, compression with sponge in the wound was substituted, and applied in the following manner: Three pieces of compressed sponge were successively passed down into the cavity of the wound, and a fourth placed over the orifice. Two graduated compresses were applied over the sponges, and the whole maintained in place by the finger of an assistant. The patient was thus relieved of the painful pressure over the neck, and time was allowed to convene the surgeons for an operation.

"*Operation* at 9, A. M. For reasons that will be stated hereafter, it was decided to apply a ligature to the internal as well as the common carotid artery. The procedure was as follows:

"An incision three inches in length was made from a point a little above the ramus of the os hyoides downwards over the edge of the sterno-mastoid muscle. This muscle being laid bare, its anterior edge was raised from its sheath and drawn outwards. A transverse venous branch that crossed the carotid at the point where it was to be tied, was secured by two fine ligatures and cut between them. the sheath of the common carotid was next opened; and a ligature passed beneath the artery, but not tied. The dissection was now carefully prosecuted upwards to the bifurcation, and the internal carotid exposed to the extent of three-fourths of an inch from its origin. In the first attempt to pass the armed needle under the artery, the patient became suddenly convulsed, his breathing stertorous,

and his pulse feeble, evidently from disturbance of the gneumogastric nerve. Further proceedings were suspended to allow these alarming symptoms to subside, which required five or six minutes. A second attempt to pass the ligature was then successful without any accident. Before tying the knot, a careful examination was made to ascertain that nothing was included in the ligature but the artery. The effect of cutting off the current of blood from the brain was also tested, by tightening the thread over the finger placed in the noose with the artery. The ligature was then tied in the usual manner, and that around the common carotid was also secured an inch below its bifurcation and above the omo-hyoid muscle. The external wound was closed with sutures, and between them strips of muslin wet with collodion were applied. Ice-water dressings were directed.

"*July* 11. Patient is progressing favorably, his pulse is one hundred, full and strong. The swelling of the parotid region has diminished. Pus mixed with blood is freely secreted from the original wound.

"14*th.* The swelling has still further subsided, and the suppuration from the original wound very much diminished.

"20*th.* The ligature has come away from the internal carotid. No pulsation is perceptible either in the facial or temporal arteries of the right side.

"21*st.* The ligature came away from the common carotid.

"*Aug.* 5. Patient has complained for the last four or five days of severe pain over the right side of the head and face, anterior to the ear, and has had frequent slight hemorrhage from both nostrils. The wounds have nearly healed. No excitement of pulse. Ordered cups and scarifications to the temples.

"12*th.* Since the last report, blisters have been applied behind both ears, and with decided relief of the pain in the head. The epistaxis has recurred but once, and only in a slight degree. His bowels are constipated.

"14*th.* The pain in the head has returned this morning with great severity. Constipation still persists, in spite of active

purgatives. Ordered a blister to be established on the forehead with aq. ammon. fort.; and croton oil, gutt. ij. to be taken, and followed by enema, if necessary.

"15*th.* The head is much relieved. The bowels have been freely evacuated. The blister to be continued behind the ear.

"26*th.* The patient's general condition is improving; his bowels, however, still continue obstinately constipated, and require the most active purgatives to move them. The wounds have not yet entirely healed; that in the parotid region is converted into a fistula, from which saliva flows freely especially during the act of mastication. The mouth, when opened, is still drawn to the left side; the right half of the tongue has become atrophied and flabby, presenting longitudinal wrinkles on its surface. Its appearance strangely contrasts with that of the left half, which retains its natural plump and healthy condition.

"*Sept.* 21. Everything continued to progress favorably till this morning, when patient became feverish, and sick at his stomach. During an effort to vomit, he was suddenly startled by a gush of arterial blood from the wound in the neck, amounting to about two ounces. Before assistance could reach him, the hemorrhage ceased spontaneously.

"*Oct.* 18. No return of hemorrhage. The salivary fistula noticed above has closed under the influence of pressure applied with the end of the fingure to the orifice of the fistula during meals. Patient was discharged cured this day.

"Several months afterwards, when he presented himself for examination, the right half of the tongue was still found atrophied and shrivelled, though the function of taste remained unimpaired. The mouth was drawn to the left side, distorting the face. His articulation continued thick and indistinct.

"*Remarks.*—The situation and depth of the wound in the above case, as well as the profuseness of the hemorrhage and the extreme difficulty of controlling it by pressure, plainly indicated that a large artery had been divided. The external carotid artery and certain of its branches, as well as the internal carotid, lay close together in the region occupied by the track of the wound, and it was impossible to say which of them might be involved.

"In the choice of means for arresting permanently the hemorrhage, the following considerations were carefully weighed:

"1st. In reference to securing the divided vessels in the wound. This undoubtedly would have been the most reliable method, and is the one prescribed by the rules of surgical practice. It is not, however, always admissible. Obstacles may exist, depending on the inaccessible location of the wounded vessel, or other equally insurmountable difficulties. In this case, the wounded vessels lay deep in a narrow space bounded anteriorly by the ramus of the lower jaw, and posteriorly by the mastoid process and the sterno-mastoid muscle, which presented unyielding barriers that forbade any distension of the edges of the wound, even had it been admissible to enlarge it by incision. The exposure of other larger vessels to be wounded in attempting this operation, and the extreme difficulty of controlling the hemorrhage by compression of the common carotid during the operation; they were all weighty reasons, that deterred from resorting to this method.

"2d. Ligature of the common carotid. This is the resource heretofore most generally relied upon in wounds of the neck, when tying the wounded vessels has been inadmissible. Though it has succeeded in many cases, yet it has not unfrequently proved ineffectual, and that oftener, no doubt, than the records of surgery disclose. The free communication between the internal carotids of either side through the circle of Willis, permits a return current to be promptly established through the internal into the external carotid and its branches of the same side, after the ligature of the common trunk. This was illustrated in the writer's own experience a few years ago, in a case of self-inflicted wound of the throat, exposing the left thyroid cartilage. A profuse secondary hemorrhage occurred at the expiration of five or six days, for which the common carotid artery was tied. One hour had scarcely elapsed before the hemorrhage recurred almost as profusely as at first. Compression kept up by means of a succession of assistants was relied on for three or four days longer, when a third repetition of the hemorrhage rendered it necessary to resort to other means. The original wound was

now enlarged and explored, and after much difficulty, the bleeding vessel was secured. It was found that a small false aneurism had developed itself at the bottom of the wound around the divided vessel. Another consideration that dissuaded from the operation of tying the common carotid artery alone in this case, was the fear entertained that the internal carotid might itself be wounded.

"The novel operation which was resorted to in this instance, and which was so successful, was thought to be adapted to any contingency that might exist. By cutting off simultaneously the direct current through the common carotid and the return current through the internal carotid, hemorrhage from a wounded branch of the external carotid would be effectually controlled; and in the event of a wound of the internal carotid, the circulation would be rendered stagnant in that vessel by the ligature applied to it near its origin, and the process for its permanent closure would be secured by the simultaneous ligature of the common carotid."

ARTICLE XVI.

"*Micro-chemical Researches on the Digestion of Starch and Amylaceous Foods.*" By Philip Burnard Ayres, M. D., London. Communicated by John Bishop, Esq., F. R. S. Received January 11, 1855.

After some general historical remarks on the methods hitherto employed in the investigation of the complicated phenomena of the process of digestion, the comparatively small results obtained by chemical analysis of the contents of the stomach, intestinal canal, and of the evacuations, by Tiedmann and Gmelin, Berzelius, and others, the author proceeded to demonstrate the necessity of a minute examination of the contents of the alimen-

tary canal by the microscope, and such chemical tests as we possess for the determination of the changes of such articles of food as exhibit definite structure.

In order that we may ultimately arrive at a complete exposition of the phenomena of digestion, he is of the opinion that it will be necessary to examine—first, the structure of particular kinds of food, then the changes produced in them by cooking, and lastly to trace the changes they undergo at short intervals, through the alimentary canal from the stomach to the rectum. The results of a series of researches of this character on the changes in starch, and starch containing foods, are presented in this memoir.

The method adopted for the examination of the changes in starch and starch-foods was as follows: an animal was kept fasting twenty-four hours, and afterwards confined to a diet consisting of the starch or amylaceous food, with water, for five or six days, until the debris of all other kinds of food previously taken were cleared from the alimentary canal. At a determinate time, after a meal, the animal was killed, the abdomen laid open as quickly as possible, and ligatures placed at short intervals on the intestinal canal, from the pyrolus to the rectum. The contents of the stomach and each portion of the intestinal canal included between the ligatures was then carefully examined. This mode of examination sufficed to determine the changes which occur in the food during normal digestion; but other questions as to the particular secretion or secretions by which the changes observed were effected.

The fluids poured into the alimentary canal are five in number—the saliva, gastric juice, bile, pancreatic juice, and finally, the intestinal mucus.

The influence of the saliva is easily determined, by chewing the particular food subjected to experiment, and keeping the mixture at about 98° Fahr. The combined action of the saliva and gastric juice is seen in the contents of the stomach. To determine the action of the bile, the common bile-duct was tied, and to ascertain the action of the intestinal mucus, it was necessary to ligature the bile and pancreatic ducts. If the digestion of

the substance is not effected in the stomach, it is evident that it cannot be attributed to the saliva or gastrice juice; if the digestion is still effected in the intestinal canal after ligature of the bile-duct, it cannot be attributed to the action of the saliva, gastric juice or bile; if it still go on after ligature of the bile and pancreatic ducts, the digestive power must of necessity be referred to the action of the intestinal mucus, provided no change has previously taken place in the stomach; but if the food passes unchanged after cutting off the supply of bile and pancreate juice, but proceeds after ligature of the bile-duct alone, the act of digestion must be referred to the pancreatic juice.

The author first briefly describes the structure of the starches and starch-containing vegetables employed in his experiments; then the changes produced by cooking, and finally enters on a minute description of the changes observed in the experiments he performed on normal digestion, and after cutting off the supply of bile and pancreatic juice.

The correct appreciation of the structure of the starch-granule is of considerable importance in relation to these investigations, and the author believes that he has been able to afford a satisfactory solution of this vexed question. The changes observed during the digestion of starch favor the original opinion of Leuwenhoeck, that the starch-granule consists essentially of an investing membrane or cell-wall, enclosing an amorphous matter, the true starch, which strikes an intense blue color with iodine; and these changes also support the opinion of Professor Quekett, that the concentric circles seen on the starch-granules of many plants are simple foldings of the investing membrane, leaving it still doubtful, however, whether these concentric circles are not in the starches of some plants composed of linear series of dotted elevations or depressions of the investigating membrane.

By these experiments it was determined that the concentric circles remain after the whole of the starch matter, colorable by iodine, was removed, and that even then the characteristic cross and colors were still seen when the granules were viewed by polarized light, although more feebly than before; this re-

sult being probably due to the lessened power of refracting light, after the removal of the starch matter.

After describing the structure of the wheat-grain and flour, the changes occurring in the wheat-starch during the manufacture of bread are given in detail; but the most interesting of the changes produced by cooking are those seen in the boiled or roasted potato and in the boiled pea.

In each of these the act of cooking effects two purposes: it causes great enlargement and physical change of the starch-granules, and dissolves the intimate adhesion of the starch-cells, which afterwards appear as ovid or globular, slightly adherent bodies distended by the swollen starch granules, the outlines of which are indicated by more or less irregular gyrate lines, produced by the mutual compression of the starch-granules within an inelastic cell-membrane.

The starch-granules of the pea possess a much thicker investing membrane than those of the potato, which causes their outlines to remain much more distinct after the removal of the true starch substance during theprocess of digestion. The other structures seen in the pea are carefully described; the most curious among them being the cells composing the external layer of the testa, which bear so strong a resemblance to columnar epithelium of the intestine, that they might be mistaken for the latter by an inattentive observer.

The substances submitted to experiment were—1, boiled wheat-starch; 2, wheaten bread; 3, uncooked tous les mois; 4, boiled tous les mois; 5, boiled potato; 6, uncooked peas; 7, boiled peas; 8, boiled peas after ligature of the bile-duct; 9, boiled potatoes after ligature of the bile and pancreatic ducts. Several subsidiary experiments were made to determine the action of the intestinal mucus, the saliva, and the substance of the pancreas, on starch.

The conclusions at which the author arrives from the experiments are:

1. That the starch-granule is composed of two parts, chemically and histologically distinct, a cell-membrane and homogeneous contents. The markings seen on many varieties of starch are referred to folds or markings of the investing membrane.

2. No perceptible change occurs in the starch, whether raw or cooked, during its sojourn in the stomach of quadrupeds or the ventriculus succenturiatus and gizzard of birds; all the granules preserve their perfect reaction with iodine and their pristine appearance.

3. The conversion of boiled starch into dextrine and glucose is chiefly effected in the first few inches of the small intestine, but it continues to take place in a less degree throughout the entire intestinal canal.

4. In the digestion of boiled wheat or other starch, or of wheaten bread, the bulk of the mass rapidly diminishes in its passage through the small and large intestines, so that it ultimately yields only a small quantity of fæcal matter. After being deprived of their contents, the membranes of the granules shrink and shrivel up into a minute granular matter, which constitutes the chief bulk of the fæcal evacuations after an exclusive diet of starch food.

5. The digestion of raw starch food (peas) in the pigeon or other granivorous birds goes on much more slowly, and progresses pretty equally throughout the entire intestinal canal. The starch-granules, whether free or included in cells, become intersected by radiating or irregular lines or fissures, more or less opaque or granular; they also gradually lose their characteristic reaction with iodine; and this important change, commencing at the surface, progresses towards the centre, until the whole of the starch matter is removed, leaving the starch-membranes often apparently whole, retaining their characteristic markings. The fissured and granular condition of the starch-granules is not due to their trituration in the gizzard, but to the action of the intestinal fluids, since it was often seen in granules enclosed in and protected by perfect starch-cells. In the digestion of raw starch food, a considerable quantity always escapes change, for many starch-cells and granules in the fæces perfectly retain the characteristic reaction with iodine.

6. As the starch remains unchanged in the stomach, its conversion into glucose cannot be attributed to the saliva or gastric juice, unless we suppose these fluids to remain inactive in

the stomach, and suddenly to regain their activity in the first part of the small intestine. The author found that the saliva was capable of effecting the conversion of starch into glucose, but that the mixture of saliva and gastric juice in the stomach did not possess that property even after being rendered alkaline by carbonate of soda. It is probable that the converting power of the saliva, as it flows from the mouth, depends not on the true saliva, but on the buccal mucus; for Magendie found that saliva taken from the parotid duct was wholly inactive, while the mixed saliva from the mouth effected the conversion with great facility. Unless, then, the sublingual and submaxillary glands secrete a different fluid from the parotids, it is evident that the activity of the saliva must be attributed to the buccal mucus.

7. The difference between the digestion of boiled and raw starch in dogs is seen in the experiments on the digestion of boiled wheat-starch, boiled tous les mois, and bread. In all these, some starch-granules escape the action of heat and water, and remain in nearly their pristine condition. These uncooked starch-granules undergo slow and imperfect changes, being fissured, broken, and more or less altered, but, in general, retaining their characteristic reaction with iodine.

8. The conversion of starch into glucose is not effected by the bile, since after ligature of the common bile-duct, the changes occur to as great an extent as when the bile passes freely into the intestinal canal.

9. It is not due to the pancreatic juice, inasmuch as after ligature of the bile and pancreatic ducts in the same animal, the digestion of starch is still effected.

10. The only remaining secretion is the intestinal mucus, which is especially abundant at the upper part of the intestinal canal; and a further proof is afforded of the activity of the intestinal mucus taken from the upper part of the duodenum above the entrance of the pancreatic duct after ligature of this duct and the common bile-duct, by its capability of converting a large quantity of fresh-boiled starch into glucose out of the body.

11. In the cooking of starch containing vegetables, such as

potatoes and peas, the adhesion of the starch-cells is dissolved or weakened so as to render them easily separable and amenable to the action of the intestinal fluids. At the same time the starch-granules undergo a large increase in bulk, distend the cells, and by their mutual compression, their outlines present the appearance of gyrate lines beneath the cell-wall. The cells seldom burst so as to admit their contents, or present any appreciable opening through which the intestinal fluids can directly penetrate. The author cannot positively affirm so much of the starch-membranes, because these are so extremely delicate that fissures might be invisible, but he believes that in a great number the membranes remain entire.

12. If this be the case, the conversion of starch matter into glucose must be effected by the permeation or endosmose of the intestinal fluids through the invisible pores of two membranes, in the digestion of the pea, the potato, and other similar foods, and the glucose must escape through the same membranes by exosmose.

13. Before the conversion of starch into glucose, the amylaceous matter contained in the starch is more dense than the intestinal mucus in immediate contact with the cells, and an inward current or endosmose is established; but after that conversion the syrupy fluid is less dense than the mucus, and then an outward current or exosmose occurs, by which the glucose escapes from the cells into the intestine and is absorbed. If this be the case, as the details of the experiments tend strongly to prove, a new and important function is assigned to the intestinal mucus.

14. In normal dsgestion, chyme escapes very slowly from the stomach into the duodenum, in small quantities, as it is detached from the alimentary mass by the muscular movements of the stomach, and this gradual propulsion often occupies several hours after a meal. This slow propulsion is evidently intended to expose the comminuted food fully to the action of the intestinal juices, and produce an intimate mixture with them. The comparatively empty condition of the upper part of the small intestine, even during active digestion, is thus fully explained.

15. If the food be too finely divided or incapable of a second solidification in the stomach, it passes too rapidly into the first part of the small intestine, is insufficiently mixed with the intestinal fluids, and a considerable part escapes digestion. On the other hand, if it enters the small intestine in masses incapable of reduction by the muscular action of the parts or solution in the fluid, it traverses the intestinal canal unchanged, except at the surface, which is then alone exposed to the action of the intestinal fluids.

16. It is not necessary for the conversion of starch into glucose that the fluids in the duodenum or other parts of the intestinal canal should be alkaline, or even neutral, for in several of the experiments the contents of every part of the alimentary canal had an acid reaction.

17. The greater part of the intestinal mucus is not excrementitious, for little, if any, mucus is perceptible in the fæces in normal digestion, except at their surface, whereas the greater proportion of the contents of the small intestine consists of mucus. A considerable quantity of mucus is seen in the cæcum, but it rapidly diminishes in the colon, and is scarcely detectible in the fæces, except that on the surface, which is probably derived from the mucous membrane of the rectum. The author raises the question, whether one of the chief functions of the cæcum is not to effect the conversion of the intestinal mucus into some other substance capable of re-entering the blood, and performing some ulterior purpose in the animal economy.

18. In normal digestion, the separation of the epithelium of the mucous membrane of the intestine is the exception instead of the rule, as stated by some physiologists. The author questions the theory of the detachment of the epithelium of the villi in each act of absorption, on the grounds that the presence of detached epithelium was unfrequent in the whole course of his experiments; that epithelium is readily detached by manipulation; that the continual reproduction of such a vast amount of cell-tissue must necessarily be accompanied by a vast expenditure of vital force; and finally, that it is not necessary, because fluids readily penetrate epithelial membranes.

19. The passage of a given food through the whole length of the intestinal canal may occupy a comparatively short time, especially when the animal is fasting. In one experiment, where a pigeon refused food until the fæces contained no visible debris of previous food, starch-granules were detected in the fæces within two hours after a meal, and this although the intestine of this animal is extremely narrow, and about a yard in length.

20. A remarkable circumstance in the digestion of starch or starch foods is the constant presence of myriads of vibriones in the lower part of the intestinal canal. They are generally first observed in the lower part of the small intestine, as minute brilliant points, just visible with a power of 600 diameters, in active movement. They increase in numbers towards the cæcum, in which a large number of fully-developed vibriones are constantly seen. These minute organisms increase in size and length in the colon and rectum, and their fissiparous mode of propagation, first described by the author in the "Quarterly Journal of Microscopical Science," may be distinctly traced by examining the contents of these portions of the intestine.

ARTICLE XVII.

Connection of Dentition in Children with Nursing and Weaning. Clinical Lecture at the Hotel Dieu. By M. TROUSSEAU. Translated for the Charleston Medical Journal and Review.

THE most elementary questions in medicine are often the least known, and although it might seem unnecessary to pay much attention to matters of apparently so little interest, and which swarm about the practitioner, yet you should remember that Stoll wrote a chapter, entitled "*De quibusdam magni momenti minutiis,*" and accustom yourselves to neglect nothing.

The infant has twenty teeth—the youth twenty-eight—the man thirty-two. The infant's number is not complete until the thirtieth or thirty-sixth month; but they are only temporary teeth, for at the age of seven years he begins to lose them, and to acquire others more durable; at thirteen or fourteen years, this exchange is physiologically accomplished. Except that great king, who was an exception in every thing, and who was born, it is said, with two teeth, the child comes into the world with two unarmed maxillaries, and it is not generally before the eighth month that the first milk teeth make their appearance; but as the laws of nature are somewhat capricious, it not unfrequently happens that one child may have teeth at four months, while another at a year old is still without them; thus no precise limits can be fixed. Generally the two middle inferior incisors appear first, and I always anticipate a troublesome dentition when the superior teeth appear first. These first two teeth always appear together, with an interval between them varying from one to eight days; but *together*, mark it well, and this is the case with these two only. Six or eight weeks after, the two middle superior incisors make their appearance, but not together, and with an interval of eight to thirty days. The process of dentition, then, is rapid with the first two teeth, and slower with the others. Then two more are evolved, the two lateral superior incisors, in a month or two after the superior middle incisors; thus in about a year, the child has six teeth, commencing with two inferior, and continuing with four superior.

The teeth of infants come out in *groups*, *dentes in infantibus catervatim erumpunt.* The first group consists of two middle inferior incisors at about eight months; second group, two middle superior incisors about ten months; third group, two lateral superior incisors at about a year; fourth group, two lateral inferior incisors and the first four molars (six teeth in this group) at fourteen to sixteen months; fifth group, four cuspids at eighteen months to two years; sixth group, four second and last molars at thirty or thirty-six months.

The cuspids appear after the child has completed twelve teeth, and is eighteen months or two years old; their evolution occu-

pies about two or three months. There is then an interval of six to ten months; and at the age of three years, when it has brought out its last group, the process of dentition is over.

I have not spoken of groups undesignedly; for you will see that, in connection with weaning, it requires attention. An important fact is that, after the appearance of each group, the child has a short period of repose; and this is the propitious occasion for weaning. Generally no regard is paid to this; infants are weaned indiscriminately, when they have two, seven, nine, eleven, or fourteen teeth. But you most observe closely; otherwise you will lose your little patients by that terrible affection of the bowels, cholera infantum.

You will, doubtless, be often consulted about the time for weaning; never decide until you have closely examined the circumstances of dentition, and do not authorize the mother to wean her child until it has six, twelve, or sixteen teeth. In the best practice, weaning should never begin in the interval after the evolution of the first group; the subject is too young, and is usually only eight months old. And it is only with very great caution, that you should begin after the third group—if strongly desired by the parents you may consent; for there is a space of a month or six weeks of repose before the coming out of the fourth group; but be careful to remember that the child has only six teeth, that it is only a year old, and that foreign nourishment will not always answer your expectation.

The most favorable time for weaning is, undoubtedly, the interval which separates the fourth from the group; at that epoch, the child is supplied with twelve teeth, eight incisors and four molars, and has before it a sufficiently long period for repose, about two months, during which there is nothing to apprehend from the bowels; thus when the cuspids begin to appear, (and the evolution of this group is the most dangerous,) it is habituated to its new diet, and prepared for the crisis which awaits it.

Wait, then, for the fourth group before weaning. If the health of the mother, or nurse, or family interests, oblige you to authorize premature weaning, do so when there are six teeth; but if not forced to yield to some such consideration, defer until there are twelve.

Do not suppose that matters will, in all cases, progress thus regularly. You will probably see some children cut their molars before their incisors, or the superior incisors before the inferior; for although dentition proceeds ordinarily as I have indicated, yet there are often irregularities which are very embarrassing to the physician, whose chief desire is to ascertain some interval of repose. Do the best you can; examine the state of the gums and wean as soon as possible after the evolution of a tooth, as there will then probably be a brief respite.

Among the accidents to which the period of dentition is liable, the gravest and most tenacious are those of the alimentary canal. Several days before hand, the child is restless, it sleeps little, utters violent cries, sucks its fingers, presses the nipple of the nurse, refuses to take any supplementary nourishment, and sometimes even to nurse; the gums are red, and there exists a very perceptible elevation at the point at which the teeth are to appear; it coughs, the voice changes, the mucous membrane of the mouth is irritated; but as soon as the child has two teeth, the surrounding gingival tissue will become very red and tumefied.

If you administer mercury to an individual who has not a tooth in his head, and who wears false teeth, neither salivation, nor mercurial stomatitis, will ensue; but should this person have a single tooth remaining, mercurial manifestations will take place around it; the surrounding tissue of that tooth will be inflamed, while other portions will not be affected by the inflammation. Now the case is the same for the first teeth of the infant; their issue has no effect upon the gums; but at the evolution of the second group, the gums redden and swell.

With nearly all children, the process of dentition is accompanied with diarrhea; moderate sometimes, but often intense, with evacuations of a greenish color, and resembling a hash of green herbs, or clots of curdled milk, containing glairy, and even sanguineous matter. In certain cases, there is much tenesmus, with prolapsus of the rectum. These accidents, which precede by several days the issue of the tooth, often continue until the whole group is cut. Should the diarrhea not cease, you will

resort to all the necessary means to restrain and ameliorate it. During this diarrhea, weaning should not be permitted, unless the milk of the nurse should appear to you to contribute to the internal flux.

In the summer season, the disorders attending dentition are generally of the intestines, rarely of the respiratory passages. Intestinal derangements, fever, peripneumonic catarrh, and other pathologic manifestations concerning the lungs, are of frequent occurrence in the winter.

I must warn you against a certain vulgar prejudice, and enjoin upon you to combat it whenever presented. You will hear it said and repeated that *diarrhea is good for children:* it is not so, and it will often cause the death of your little patients. Diarrhea brings on chronic enteritis, and this debilitates and carries off children. By combating, therefore, this intestinal flux, you will guard the better against affections in other parts.

It is also considered improper to remove the scurf which frequently covers children's heads; but this ridiculous prejudice has ceased in England and in the United States; let us disregard it here.

If, during dentition, the evacuations should become somewhat more easy, without degenerating into diarrhea, you need not fear it; but should it continue several days, it must be checked.

The opinion is current, that constipated children are often attacked by convulsions, while those having diarrhea are never thus affected. This is not the case; diarrhea is a frequent source of convulsions, and a healthy state of the bowels generally prevents them.

I call your attention particularly to alimentation, for it is a matter of the utmost importance. Indeed, if you neglect it, diarrhea will ensue, and successively enteritis, serious indigestion and convulsions. Nothing is more common than indigestion, induced by enteritis, and leading to convulsions, and nothing is more calculated to alarm parents; they generally lose all self-command; and while the servants or the neighbors hurry off for a physician, the mother, under the advice of some over-officious old woman, pours boiling water over the feet and hands

of her child, and scalds it often to death. And this reminds me of what once occurred to an eminent colleague, Professor Marjolin, during the course of a typhoid fever, which had thrown him into a profound stupor. They applied to his legs towels dipped in water at 190°, causing large eschars, which were not healed for several months.

With regard to convulsions, the less you do the better; indeed, the paroxysm is generally over before you arrive; and although the symptoms should reappear two or three times, yet by the next day every thing is usually over. If there has been any indigestion, administer a laxative, for it is best to get rid of undigested food; let the child nurse very little; give it mucilaginous drinks, have it bathed, if necessary, and you will soon cause the disappearance of all alarming symptoms. In general, every thing succeeds, even the infinitesimals of the infinitely ridiculous homœopathy.—*Gazette des Hospitaux, Dec. 11th*, 1855.

ARTICLE XVIII.

Treatment of Typhoid Fever with Tar Water. By Dr. Chapelle, of Angoulême. (Translated for the Charleston Medical Journal and Review.)

Having observed the favorable effect of tar in a certain case of typhoid fever, Dr. C. was induced to pay particular attention to this remedy, in a series of cases occurring during the typhoid epidemic of 1854, 1855. His conclusion is, that liquid tar, if not an absolute specific, is yet incontestibly the most efficacious agent yet discovered for the treatment of the above mentioned disease. The tar should be administered internally as a drink, and in the form of an injection.

The drink is prepared in the following manner: About ℥ ij of liquid tar are put into a vessel, containing nearly a quart of

hot water; after it has stood a few hours, the patient commences to drink it, filling up with ordinary water after each draught, so that the same dose of tar will last during the whole treatment. The injection is prepared by rubbing up the yellow of one or two eggs with a table-spoonful of liquid tar, and diluting with a little more than a pint of warm water; this serves for two injections.

The patient should drink as much of the draught as he can; as to the injection, that should be insisted on in proportion as the drink disgusts, for the intestines should be always kept supplied with a certain quantity. Sometimes six, eight, and even ten enemata should be administered in twenty-four hours. Should the patient be taken with diarrhea, these injections check it promptly.

This treatment, if continued for two or three days, generally triumphs over the typhoid state; typhoid fever of ordinary intensity, called usually mucous fever, needs double that time; but typhoid fever, properly so-called, of whatever form, is vanquished in its essential phenomena in eight to ten days. Each day the skin loses its dryness and heat, the tongue becomes clearer, the abdomen presents less tension and susceptibility, the sleep is calmer, the fœcal matter acquires a more normal odor, and the digestive functions recover strength. When there exists only a simple typhoid state, the tar draught alone is commonly sufficient; but when the general perturbation augments, the febrile reaction increases, and the functional disorder is excessive, a much stronger dose of the tar is required, and the injections are then indispensable. In all cases where the breast or the head has been affected with violent perturbation, the disappearance of the ordinary typhoid phenomena does not immediately produce a cessation of these complications. These functional disorders either disappear gradually of themselves, or need the application of treatment appropriate to the morbid state.—*Rev. Medico. Chirurgicale.*

ARTICLE XIX.

Dynamometer.

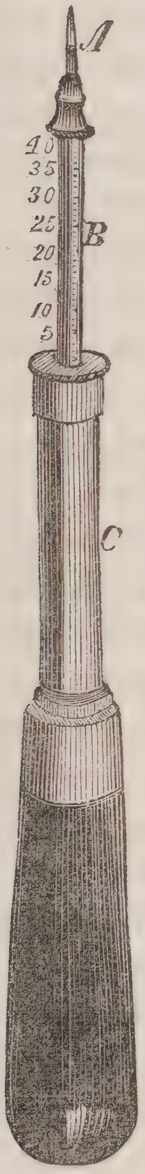
THE instrument which we have been using for the purpose of experimenting on the subject of the condensation of gold foil and crystal gold, is made by extending a beam or shaft through a common spring balance of the stores, which draws fifty pounds. This shaft is fastened to the spring instead of the wire, which is used in these balances. The shaft is left extended above the plate of the instrument sufficiently to allow of free motion, and on the upper extremity there is a small vice firmly attached, and into which a small iron ingot can be fastened at pleasure. This shaft is held in its position, when pressure is made, by a plate through which it passes at either end of the scale-plate of this common balance, and instead of its being pulled at, as in weighing articles by the shopkeeper, it is pushed upon from the utter extremity, and, of course, registers the weight on the old scale-plate; the difference is, therefore, only between pushing and pulling. Near the ingot is placed a graduating rest for the the thumb or finger of the operator, so that he can operate on the ingot, and imitate nearly all the positions assumed while operating on the mouth—thus testing very well the amount of force he is capable of exerting in those different attitudes of the hand, except that he can effect much more pressure on the instrument than upon the mouth, which we will hereafter show. It is believed by many operators that as much force can be applied in plugging teeth with the instrument held between the fingers as if it be grasped in the hand. This is not so. The greatest amount that we can apply on the dynamometer, with the instrument in the fingers, is from twelve to eighteen pounds; while, if we grasp the instrument in the hand, and let the end of the handle rest against the palm, near the wrist, we can, with much less bodily effort, exert fifty pounds, and this relative

proportion is kept up when operating on the mouth. It is true that a good plug can be made by using the instrument in that way, but it is at a much greater expenditure of labor and time than if the instrument be larger and held in the hand. In operating upon the lateral surfaces of teeth, there is seldom a greater force exerted than from five to ten pounds; that is, direct forward force. The amount of force lost by the yielding character of the parts operated upon, and lateral support given to the instrument in precaution against slipping, has never been estimated by the operator as lost: in other words, the great efforts of the operator are so distributed as to deceive him as to the amount transmitted to the condensing point of the instrument. The many complaints of the broken-down dentists, after a few years' constant and hard operating, and the weeks, and even months, of relaxation taken by some of them in warm weather, makes this a matter worthy of serious reflection by every member of the profession. A certain amount of pressure is absolutely essential for condensing gold, and must be employed by one as well as the other, and if only five pounds is effected by the one, and ten by the other, it counts in time against the one only employing five; and again, a plug that is made with a five or ten pounds pressure, and feels to be condensed under the operator's instrument, will very readily be crushed by a greater pressure with an instrument with the same condensing surface. The great length of time consumed in properly condensing a plug with a small instrument, and used under disadvantage, makes the operation of plugging a tooth too expensive to be within the reach of many persons to pay; besides, it limits the operator to a very few operations per day.

The dentist should learn, as one of the most important features in his *skill* in plugging teeth, to operate from the shoulder, and the instrument grasped full in the hand, as all the strength used to hold on to it, to prevent it slipping through his fingers, is lost to its condensing point and to the shoulder. We know a number of operators who fully appreciate the necessity of a proper condensation of a plug, but exhaust their strength in doing it. This should not be. We have also another instrument for testing the amount of pressure that is usually made in

operating on the mouth, and which can be applied to crown cavities in the superior molars. It is about nine inches long, and can be understood by referring to the accompanying cut, which is reduced to about half size.

A is the condensing point or bit, in a socket, so that any size may be used. *B* is the shaft, and on which the scale is marked, to register the amount of force applied to the instrument. *C* is a hollow cylinder in which the spring is contained. When the extremity of the shaft *B* is depressed, the opposite extremity runs into the handle *D*, which is hollow to receive it. It is with this instrument that we have corrected the very erroneous idea we entertained heretofore with regard to the amount of direct pressure we supposed we were in the habit of exerting upon a plug in the mouth, as well as the amount of pressure different patients and teeth can bear. It is a difficult matter for us to apply more than ten or twelve pounds of pressure on a superior molar of a patient of that many years of age, or a nervous and yielding patient. We never used two hundred pounds and over, in these delicate cases; but when we have an older patient, or a hard head and stiff neck, and a molar well set in a well developed jaw, and the patient firmly seated in the chair, we can apply as much as twenty-five, and even in some cases thirty pounds: this we venture when the plug is nearly done, otherwise we would fear thrusting the plugger through the tooth. A friend of ours said he thought he was in the habit of applying from sixty to eighty pounds pressure. We sent him the instrument; he applied it to a plug in the crown of a superior molar, and at twenty-five pounds the point of the instrument penetrated the plug, as he said, about the thirtieth of an inch. In experimenting on plugs out of the mouth, in teeth that we have extracted, we have not found any plugs that would bear thirty pounds, very few more than fifteen, some not



ten; in fact, every plug that we have tried were at best mere sponges, comparatively. Many of those plugs, when made and dry, would doubtless have borne a much greater pressure without giving way, but such is the influence of moisture, or something else, that they are easily penetrated by the instrument after they are worn some time. It is extremely exhausting for an operator to keep up a prolonged pressure of from fifteen to twenty pounds upon a crown plug of a molar tooth. We will continue our article in the next News Letter, and especially on the *cylindrically* prepared gold.—*News Letter.*

ARTICLE XX.

Local Anæsthesia.

Editor Dental Recorder:

Dear Sir :—Since the issue of the December number of your valuable journal, containing some account of J. Richard Quinton's experience with anæsthesia by congelation, I have labored almost day and night to perfect an apparatus, by which a cold fluid could be successfully applied for the extraction of teeth.

I little thought, when I drew a plan upon paper, that it would require several weeks to get into operation, but, let the requisite amount of time be what it may, it was not ready for use in my hands, with all I could learn from the truly valuable and interesting account referred to, until about the 15th of the present month (Feb.,) although I had submitted to what I considered a successful application in my own mouth some weeks sooner.

I have found much difficulty in the preparation of an apparatus that will prevent the flow of fluid in the mouth (and still be applicable to tooth and gum.) This having at length been successfully accomplished, I found myself under some embarrassment to find some person who was willing to allow me to experiment upon teeth, by extracting them when I thought I had pro-

duced the requisite loss of sensation. In this I at length succeeded, by offering a reward to a lady who was once above want but now obliged to sew for a livelihood, and who was dreading, as well, the expense of artificial teeth, as the removal of a quantity of old stumps and decayed teeth. By this means, I have had ample opportunity to experiment in the patient's mouth, not only upon the anæsthesia, but the improvement of the apparatus.

In the early part of my experiments, I found that something different from an elastic tube, with the flow regulated by stop cocks, was required for general use. Although such an apparatus could, in some cases, be used with an assistant (which, although provided with one myself at present, I have very good reason to suppose dentists are not very generally so fortunate.) Hence my object has been so to adapt the instrument that it could come into general use, and even be applied by one acquainted, in his own mouth. This I have so nearly accomplished, as to have one ready and now in use by myself, and as soon as I can get the apparatus made in any quantity, I shall be willing to demonstrate the *modus operandi* to the profession, should it be desirable. I am convinced, from my own experience, that the principle as laid down by Quinton, is, in fact, applicable in dental surgery; but I am not fully convinced as to the specific degree of cold necessary to use. On this point I am still experimenting; the result of my experience, thus far, I would give at this time, were I not prevented from want of time. So far as my experience goes with the use of this new agent, I am highly gratified with the result, as it has placed the matter on this ground,—*that it can be successfully employed by competent hands.* The fluid thus far used by myself was known in my "school-boy days," but I think I have, in some instances, used a colder fluid than necessary; but in this matter much depends upon the mode of application. But as there is no danger in experiments, that matter can be easily determined so far as to insure success.

H. L. Burpee.

35 Fourth-st., Brooklyn, E. D. [*Dent. Rec.*

ARTICLE XXI.

Continuous Gum Work.

To the Editor Dental Recorder:

The frequent applications made to me for a minute statement of a system for using the body and gum materials, I prepare with "*positive* and *certain* success in *every case*," induces me to place the following before your readers:

In the preparation and combination of the ingredients composing the body, I find it necessary that all should be kept dry until put up (for sale,) and although every particle is sifted through a No. 11 bolting cloth, and is made much finer than many suppose necessary, yet it is unfit for use unless ground in water, in small quantities, *twenty-five to thirty minutes.*

The reason for this is simply as follows: two important ingredients composing it are entirely different from the remaining dozen, and each fusing at different degrees of heat from all the rest, their virtues or properties are lost before the whole is vitrified by fusion upon the piece of work, unless ground in water as before stated.

The grinding in water appears to intermix and combine the whole when baked into one, and an entirely different compound from any of the separate ingredients, or even the final combination, (if not thus ground,) and gives it the solidity and firmness upon the plate and around the teeth, so desirable for good work.

The body should be worked thoroughly between the teeth, and compressed until hard and close as pipe clay. The piece should be moved slowly into the muffle and remain at least *one-half hour*, at a *steady red heat*, after which the heat may be raised to a few degrees above the melting point of pure gold, and the set withdrawn to cool in a close extra muffle.

If baked in a quick or high heat, the surface will glaze, while the inner portion remains but slightly vitrified. If a second coat of body is required, it should be treated as the first.

If possible, nothing, not even the hand, should be brought in contact with the body after it is baked, before applying the gum. A particle of grease or dirt upon it may prevent a perfect reunion.

The gum is always to be used as put up, and should be laid on even, and quite moist, aud always left so as to require no carving or trimming except what may be necessary around the necks of the teeth.

If a layer is put over the first, no matter how thin, it is liable to flake up in baking. The same would occur if the gum is pressed or moved after it is first put on. Clock spring spatulas are found most useful in applying it. The piece should be heated up slowly and with care, but fused at a quick heat, *not exceeding four to five minutes.*

The *enamel* for "etched teeth," is to be moistened to the consistence of cream, and applied evenly upon the tooth (thick or thin as required) with a sable hair pencil.

It may be put on at the second baking of the body, or with the gum; its properties being almost entirely equivalent to the latter, minus the color.

Respectfully, &c.,

C. S. Putnam, 35 Bond-st.

[*Dent. Rec.*

ARTICLE XXII.

Memoir on the Loss of the Teeth. By DR. ROSSI, Paris, 1852.

A GREAT many books have been written on the teeth. But few have written earnestly and conscientiously. The greater number in our epoch have had no other aim than to display false erudition, often borrowed or paid for, or what is still more deplorable, to cast their name noisily before the public. As for the last mentioned, their desire to usurp a place among men of merit, is not even an excuse.

It is not our intention to write a bibliographical and critical work; we will quote nobody nor discuss any opinion. We wish to sketch a complete and rational theory, in which the facts are all of equal value, and explain themselves. We do not pretend to have discovered all, or to have invented all. Let those who think they have something to claim, reclaim it.

Our theory is an absolute affirmation, because it is based upon truth.

We will be brief, because we have not twenty varieties of a fantastic disease called *caries*, to describe. It has also appeared to us unnecessary to examine the value of the pathological doctrine of which our venerable member, Doctor Duval, has been a promoter. It begins to lose many of its partisans, and the strong faith in which it was proclaimed in our youth, has already become much enfeebled. Observers of the present day are in a state of doubt, and we now hear eighteen or twenty kinds of caries spoken of only by some new and courageous compiler, who enumerates, as truths, the speculations of past ages. We esteem the author of *Dentiste de la jeunesse*, without always sharing his opinions.

He may feel consoled, however, even if his doctrines begin to be severely shaken. During a period of forty years, numberless writers have been supplied by him. Books, pamphlets, articles

for dictionaries, treatises on surgery, &c., have copied and re-copied him to satiety. He might often have laid claim to right of authorship, if a juster law had existed.

We do not count upon the same success. Truth is our only support, and we know how importunate it is sometimes. And, finally, certain men, still puffed up by their collegiate pride, consider themselves as *the doctors* of this protean disease, styled *caries*. To descend from this scientific throne requires a denial which is not easy for human weakness to bear. However this may be, we will not be led by this spirit. The spread of truth, even if slow and obstructed in its course, is not less sure, and we have among us honest hearts and noble spirits, who always accept a ray of light, from however humble and lowly the source.

Lastly, a consideration of the utmost importance prompts us. False doctrines often lead to fatal consequences. The means proposed to be employed to overcome the loss of the teeth, flow from the opinions, false or true, which are held upon this subject. It is clearly evident then, how important it is that the truth be known and accepted, in order that error lead no more to injurious operations and to inefficacious treatments.

We shall feel sufficiently rewarded if we have contributed in any measure, however small it may be, toward this desirable result.

Proposition.—Assertion.—The change in the teeth, improperly called CARIES, *is a chemical phenomenon, the causes of which are all, and always, apart from life.*

Philosophically expressed, a change in a tissue has an essential and inevitable cause, a modification of nutrition.

In order that this modification of nutrition be possible, the tissue must possess nerves and vessels.

But, the osseous tissue of the teeth receives neither vessels nor nerves.

Therefore the change in the osseous tissue of the teeth, so singularly called CARIES, is not a modification of nutrition, a disease.

In an animal, only organic or inorganic phenomena can take place.

But the change of tissue which occupies our attention, cannot be an organic phenomenon, since it does not result from a modification of nutrition.

Therefore, the alteration in the tissue of the teeth, improperly called *caries*, is an organic phenomenon, or in other words:

This change is a chemical phenomenon, in which the causes are all and always apart from life, which is the assertion of this proposition.

Exposition.—§ A.—The osseous tissue of teeth is never diseased.

The destruction of the tooth is due to *a single cause*—the action of one or several acids.

These acids exist,

1st. In the fluids secreted by the subject.

2d. They are produced by elements coming from without, in food, or already formed, directly introduced into the mouth.

Acids secreted by the subject, are found in the buccal mucus, in the saliva and gastric juice. Their quality and quantity depend upon the constitution of the subject, upon a natural though transient state, (pregnancy, lactation,) upon certain diseases to which one may be, for a time, subjected.

The acids produced from elements brought from without, arise from the decomposition of food in every place where it can lodge. This fermentation is putrid or acid. Certain food furnish more active and concentrated acids than other. Acids introduced into the mouth that are already formed, are generally in drinks or medicines.

§ B.—The decomposition of teeth by acids is considerably favored by predisposing causes, which we will enumerate:

1st. By the quality of the tissue of the teeth.

2d. By the form of the teeth.

3d. By the arrangement of the teeth.

4th. By traumatic lesions.

DESTRUCTION OF THE TEETH.

ONE CAUSE.

ONE OR MORE ACIDS.

- Secreted by the subject in
  - The buccal mucus.
  - The saliva.
  - The gastric juice.
- Formed by elements, independent of the subject
  - and resulting from the decomposition of food.
    - putrid substances (meats, etc.)
    - acetic substances (milk, etc.)
  - or existing before their introduction,
    - in certain drinks (cider, etc.)
    - in certain medicines (sulphuric lemonade, etc.)
- Favored by particular condition. (predisposing causes.)
  - 1st. Quality of the tissue of the teeth.
  - 2d. Form of the teeth.
  - 3d. Arrangement of the teeth.
  - 4th. Traumatic lesions.

[Dent. Rec.

QUARTERLY SUMMARY.

ANATOMY AND PHYSIOLOGY.

1.—*Functions of the Spleen.*—Recent researches, as our readers are well aware, have led to a more settled notion of the functions of this mysterious organ, though many important questions relating to them are still in dispute. The names of Gray and Kölliker are conspicuous among those who have contributed to our knowledge of its structure and functions.

The opinions generally entertained may be briefly summed up as follows: The spleen is considered as a storehouse of nutritive material, and as a workshop for fitting the albuminoid matter it receives, during digestion, for the use of the system. It is also thought to have some agency in manufacturing blood corpuscles, as well as in promoting their disintegration. It has long been regarded as a *diverticulum* for blood accumulating in the system, especially in the portal vein. The enlargement of the organ in intermittent fever, which induces congestion of all the abdominal viscera, its periodic swelling during the act of digestion, accounted for by the sudden addition of a large quantity of material to the blood, and its increase during all obstructions to the portal circulation, whether natural or artificial, lead to this conclusion. In addition to this, some cases recently recorded in the Medical Times and Gazette, of London, are exceedingly interesting, in relation to this view of the functions of the spleen, as it looks to the general vascular system, as well as the immediately adjoining veins. They are cases of enlarged spleen during suppressed menstruation, the chief dilatation occurring at the time the monthly flow should have manifested itself, but continuing, like most morbid action, after the first exciting cause had ceased to act.

M. Vulpian, however (as quoted by the *Virginia Medical Journal* from the reports of the *Societe de Biologie*.) has lately submitted a memoir on the effects of removing the spleen from a dog, which go to show that the loss of the spleen is not very severely felt. The animal lived six years and a half after the operation, without any

appreciable derangement of health. Shortly before his death, his blood was examined with reference to its relative proportion of white and red corpuscles. This was found to be normal, when compared with that existing in the blood of a dog upon which no operation whatever had been performed.

The necropsy revealed no increase of the thyroid bodies or the supearenal capsules, which ought to have been hypertrophied, if they were engaged in the same blood-renovation as the spleen, as is usually supposed. The liver was healthy, and full of sugar. There was disease of the heart and ossification of the aorta, which, however, can hardly be supposed to be at all connected with the operation. The spleen was gone, not a trace of it was to be found.

To give greater completeness to the account of the present state of opinions on the functions of this mysterious organ we make an abstract of Mr. H. Gray's views, which we abbreviate from Dr. Carpenter's review of his work, in the British and Foreign Medico-Chirurgical Review for January of last year.

The *development* of the spleen takes place from a distinct centre, and is not as some anatomists suppose, evolved from the same mass with the pancreas. In the fœtus, the history of the development of this organ goes to show that its function is not mainly exercised during intra-uterine life; that it is not *then* either a blood forming or a blood destroying gland. A process of cell-growth goes on while the arteries are being formed, and one of cell-destruction during the development of the splenic vein. From this it is inferred that some secretion is collected in the gland ready to be removed by the veins as soon as they are developed. In the chick, the Malpighian vesicles are not developed till near the end of incubation. The development of the splenic vein does not take place till after green bile has been secreted by the liver, so that Kölliker's notion, that the coloring matter of the bile is formed entirely at the expense of blood-corpuscles which have been disintegrated in the spleen, cannot be adopted.

The weight of the spleen differs at different ages. Towards the end of fœtal life it is 1-300 of the weight of the body, while during adult life it varies from 1-320 to 1-400. In old age it is only 1-700. Hence it follows that the spleen exerts its peculiar function most energetically during the most active period of growth and nutrition.

As to its relations to digestion, he found that its weight increases

considerably near the close of this process, or when the new material is becoming or has become blood, and that it decreases considerably after the final completion of that process.

In his description of the *anatomical structure* of this organ, he generally coincides with previous observers. The muscular fibres of the trabeculæ, according to him and many others, possess very feeble contractile properties. In most animals no contractions were produced, while in dogs and cats there was only a slight wrinkling of the surface.

The capillaries terminate sometimes directly in the veins which are dilated at the point of union, but oftener open into intercellular spaces with which the veins are connected. The veins originate (1) by direct continuity with the arteries, (2) by lacunar spaces, (3) by ideal pouches, the second being by far most frequent. They expand very rapidly, and are extremely distensible.

Mr. Gray repeats what had already been said by others that there is a continual process of cell development, growth and decay, going in the pulp of the spleen, accompanied by the formation of nuclei, around which blastema and cells are formed, and which ultimately disappear with these enclosing structures. He adds, however, from his own observations, that these parenchyma-cells are in direct proportion to the activity of nutrition and are particularly frequent when the addition of new material exceeds the waste of the body, whereas, when waste predominates over repair, they are not to be found at all. These parenchyma-cells closely resemble the colorless corpuscles in the blood of the splenic vein. The colored components of the spleen are affirmed by Mr. Gray to be red corpuscles variously modified.

The blood discs found among the parenchyma-cells of the spleen are regarded by this observer as proper constituents of the pulp. These blood discs are usually in various stages of disintegration, till they are found at last reduced to mere granules. Sometimes, however, they exist in their normal condition, invested by a non-nucleated cell. The blood-corpuscle-holding cells, are large, spherical or oval, containing a variable number of altered blood discs and pigment-granules derived from their destruction. These granules are also dispersed through the pulp, together with reddish crystalline forms.

The quantity of these bodies present was influenced by the state

of nutrition of the animals, being most abundant when that was highest.

Chemically, the chief component of the spleen pulp has an albuminous character. The coloring matter is identical with hæmatin. The reddish crystalline bodies seem to consist of Vischow's hæmatoidin. No relation was traced between the coloring matter of the spleen and that of the bile. Of iron there was 16 per cent. in the ash, and of phosphoric acid 40 per cent., a decided indication of the derivation of the spleen-substance from blood corpuscle. Lactic acid was found, but neither uric acid nor hypoxanthrei.

The *Malpighian corpuscles* are invested with a distinct fibrous membrane derived from the sheaths of the arteries and nourished by fine capillary vessels which ramify over their surface and penetrate their interior. Their contents are granular blastema, nuclei and nucleated cells, corresponding perfectly with the colorless portions of the spleen. Hence Mr. Gray supposes that the same processes of cell-development, cell-growth and cell-destruction go on in the corpuscles as in the pulp.

He found the size of these corpuscles to correspond very exactly with the state of nutrition in the animal experimented on, the maximum of size being attained in highly fed animals, while in the ill-fed, the corpuscles were smaller, and, in some instances, almost entirely absent. Hence it may be supposed that these corpuscles store up the surplus albuminous aliment. Furthermore, during the latter part of the act of digestion and a short time after its completion, they are most abundant, while long after or just before the commencement of this process they are fewest. The nature of the diet also affected them. Thus, when cats were fed on boiled white of egg, the whole spleen acquired a large size, and the Malpighian corpuscles were peculiarly obvious, while, when fed on fat, lean meat, or gelatin, the spleen dwindled to less than one-half its size and the corpuscles became so small as to be invisible to the naked eye. The supply of water modified the size of the corpuscles and the fluidity of their contents.

Remell, Leydig and Huxley state, that the wall of the corpuscles is not separated by any distinct line of demarcation from its contents or the surrounding pulp. They, therefore, regard them as portions of spleen pulp more or less isolated from the rest.

The absolute quantity of *blood* varies with the day. It is greatest about 16 hours after eating; least, about 48 hours after food. In in-

anition, it rapidly diminishes, and all obstructions of the liver, heart or lungs, greatly augment the size of the organ. In *diving* animals the spleen is very large, an interesting fact in view of the theory of its acting as a diverticulum.

The splenic blood was shown by the *microscope* to contain particles of blood, altered like those found in the organ; *occasionally* corpuscle-holding cells; *almost always*, pigment-granules and always large quantities of white corpuscles. The solid matter in blood of the splenic is *less* than that of common venous blood, the red corpuscles not more than half as numerous, the fibrin and albumen both increased, especially the former. The serum of splenic blood has a reddish-brown tinge.

He believes the function of this organ to be; 1, the modification of the constituents of the blood-corpuscles; 2, the formation of a sort of "sinking fund for albuminous materials." The spleen, therefore, according to him, balances both the quantity and the quality of the blood. He acknowledges the slight effect produced by the extirpation of this organ and says that in some of the animals on which he operated, the process of nutrition seemed to go on more vigorously after the extirpation than before. Dr. Carpenter thinks the author proves too much, and is inclined to believe the change, in the blood, which he describes, accidental, arising from a stagnation or retardation of the circulation in this organ.

2.—*Pancreatic Juice.*—Schmidt has recently been experimenting on fresh pancreatic juice, allowed to flow through a fistula. Some interesting facts were ascertained relative to the influence of the operation upon the secretions. The fluid collected immediately after the establishment of the fistulous opening contained six times as much solid matter as that which escaped afterwards. The fluid obtained from the permanent fistula is transparent, colorless, alkaline in its reaction and having a specific gravity of 1.010 to 1.011. At the temperature of 98.6° it instantaneously converts starch into gum and sugar. Schmidt repeats the statement that two per cent. of the secretion would be sufficient to convert all the starch consumed in twenty-four hours into sugar. He, therefore, believes that the chief function of this fluid is to assist the intermediate circulation of fluids, and to saturate the acid of the chyme.

3.—*Saliva.*—Kölliker and Müller confirm the statement, long since made, that the secretion of any single salivary gland, alone, is not sufficient to convert starch into sugar. The mixture of all the secretions, in the human saliva, is admitted, however, to act with great rapidity in producing this change; and the discharge from the mouth of a patient, laboring under mercurial stomatitis, is said to saccharify even more rapidly than normal saliva. When saliva is mixed with gastric juice, in equal proportions, the conversion of starch into sugar does not take place, but when there is an excess of saliva, saccharification goes on.

This cannot be supposed to confirm the opinion of Bernard that the gastric stops the action of the saliva, for a great portion of the starch is undoubtedly converted into sugar, before the aliment reaches the stomach, and when it arrives there, the action of the gastric juice will be mainly confined to the surface, while the saccharification will go on rapidly in the centre.

4.—*Tape Worm.*—It will be remembered that some years since, Siebold and Van Beneden dispelled the obscurity resting over the generation of intestinal worms by showing good reasons for the belief that these parasites were taken in with the food. They found that the different forms, in certain cases, were only different stages of development of the same animal; that the cysticercus of one creature became afterwards the tænia of another which preyed upon it. Some doubt however, still rested over the subject, and many could not understand how the discovery of this change in the lower animals could explain the development of tape worm. Küchenmeister has just completed the demonstration by showing the actual change of cysticered into tænia in the human subject. Cysticerci were administered to a criminal under sentence of death, from 72 to 12 hours before his execution. After death, no less than ten young tape worms were found in the man's duodenum.

5.—*Influence of the Spinal Cord on the Movements of the Iris.*—An interesting case was presented to the Medico-Chirurgical Society, of Edinburgh, at a recent meeting. A patient had aneurism of the subclavian artery pressing backwards, and consequently compressing the sympathetic nerve. The remarkable point about the

case is that the disease was accompanied by *permanent contractions of the pupil.*

The circular fibres of the iris which contract the pupil so supplied by filaments of the third and fifth nerves, while the radiating fibres, which dilate it, get their nervous supply from the sympathetic filaments which unite with the fifth, in front of the Casserian ganglion. Hence stimulation of the sympathetic nerve in the neck causes dilatation of the pupil, and section of the same produces contraction, passively, by cutting off the supply of dilating power. In this case compression acts in the same manner as section. On following up this nervous connection, it becomes manifest that the sympathetic nerve does not originate the dilating power, but that it receives these motor filaments from the spinal cord between the fifth cervical and sixth dersal. This is proved by the fact that section of the spinal nerves coming from this tract, the *regio cilio-spinalis,* has the same effect as section of the sympathetic itself.

6. *Structure of the Spinal Cord and Spinal Nerves.*—In an inaugural dissertation before the University of Dorpat, by Philip Owsjannikow; the author has entered at great length on the structure of the spinal cord and spinal nerves. The conclusions drawn from the observations were as follows:—

1. That all the fibres of the spinal nerves which enter into the spinal cord are united to gangliated cells.

2. That one filament extends to each gangliated cell from the anterior spinal root, and from the posterior root; a third, a commissural one, from the other part of the spinal marrow; and in many fishes a fourth, passing from the brain, the presence of this single fibre passing to the brain, may, as the author throws out, be of moment in reference to the question of the possibility of the same fibre being both afferent and efferent in function, a position which Du Bois-Raymond thinks tenable, as judging from his experiments, though, as a rule, this power is not put into action, in his opinion. The author of the paper now considered, thinks, on the contrary, this aforesaid power is always put into use.

3. That from each cell of the spinal marrow, a filament extends to the brain, forming the white substance.

4. That the chief mass of the spinal marrow, containing fibre and cells, is a united areolar web, which being arranged in great abundance about the central canal, and furnished with numerous blood-

vessels, produces the ruddy gray color of the substance which is generally supposed to be owing to pigment cells.

5. That the gelatinous substance of Rolandi is connective tissue.

6. That the cells found as well in the posterior horns as in the surrounding substance of Rolandi, are corpuscles of the united web.

7. That the cylindrical axes are of a round form, and are composed of the same substance as the nervous cells.

8. That the cylindrical axes in the gray substance are formed of a membrane peculiar to themselves, which surrounding also the nerve cells, may be separated from the fundamental mass composed of the united web.

9. That in some fishes, the cylindrical axes of the spinal cord are exposed, the cellular web in which they are placed forming no especial investment.

10. That in those fishes which have anterior and posterior spinal roots, round gangliated cells are found, sending out in various directions divided branches.—*Ibid.*

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7. *Minute Anatomy of the Liver.*—The minute anatomy of the liver has been lately examined by Beale,* who, from his dissections and injections, comes to the following results:

1. That the essential constitution of the liver is that of a double network of minute vessels, one of capillary blood-vessels, and another of cell-containing tubes, naturally adapted to each other. Both of these sets of tubes in each lobule appear to communicate with those of the neighboring lobules in all livers excepting that of the pig; and this circumstance is connected with the fact, that in all other animals but the pig, the hepatic lobules are not isolated by intervening and limiting fibrous tissue or capsules. As to the latter position, Beale agrees with Weber.

2. That the cell-containing tubes are in all vertebrata continuous with the ultimate fine ducts of the viscus; in some cases directly so, whilst in others, as in the rabbit, and slightly in man and the dog, a fine network of the ducts themselves intervenes. The basement membrane of these tubes being, after fœtal life, incorporated with those of the capillaries, so that the secreting hepatic cells are

*Proceedings of Royal Society, June, 1855.

only separated from the stream of blood by a single intervening membrane. The cell tubules contain the hepatic cells, as also granular and coloring matter and cell débris; the cells observing no order of arrangement, as some have thought, and contrasting in size, &c., greatly with the epithelium lining the ducts, from which they are strictly separated.

3. That the fine ducts are many times narrower at the point where they are continuous with the cell tubes, than those tubes themselves; and that the larger ducts and larger interlobular ducts freely anastomose with each other.

4. That whilst the finest biliary ducts are only composed of basement membrane, that of the larger ones is more complex, containing numerous cavities; especially in the pig, which, although generally considered to be glands, are in fact reservoirs for the bile, retaining it, and bringing it into intimate relation with the abundant surrounding blood vessels, so that it may undergo requisite changes. This the author also considers to be the function of the vasa aberrantia, so named by Weber.

In this view, it will be seen that Beale considers the structure of the liver to be strikingly different from that described by Kölliker and Hanfield Jones, and assigns a different office to the secreting and epithelium cell; for, whilst the latter looks upon the cells of the ducts as chiefly forming the bile, Beale considers that they stand in relation to the hepatic cells as the columnar epithelium (lining the stomach tubes) does to the secreting cells at the bottom of them.

Beale prepared his specimens by injecting the portal vein with lukewarm water until the bile was washed out of the ducts by it, and then injecting the ducts; after which the portal vein was injected with size. The ducts were also examined in specimens hardened in alcohol, to which a solution of soda had been added, in order to render the sections transparent.

Dusch* finds that the hepatic cells are dissolved in bile and in solutions of glycocholate of soda. They are also enlarged on the addition of chloroform, according to Lereboullet, their contents becoming very clear.—*B. & F. Med. Chirurg. Rev., Oct.* 1855.

* See Canstatt.

EDITORIAL DEPARTMENT.

BIBLIOGRAPHICAL NOTICES.

An Essay on Intermittent and Bilious Remittent Fevers: with their Pathological relation to Ozone. By E. S. Gaillard, M. D., Charleston. Walker & Evans, 1856.

This little treatise was originally submitted to the faculty of the Medical College of South Carolina, as an inaugural dissertation, for the degree of doctor of medicine. By them it was considered worthy of the annual premium bestowed by that college upon the best essay submitted by the graduating class. By the author it is so favorably thought of that he has given it to the public in its present form. We doubt the propriety of this. It is indeed highly creditable as a thesis of a candidate for graduation, but it appears to us that its value would have been increased had its author delayed its publication till matured experience had corrected or confirmed some of the hypotheses advanced. This would have enabled him to avoid some grave errors.

In speaking of ptyalism, for example, he has wholly misconceived Melseus' views of the application of iodide of potassium to the treatment of mercurial poisoning. Dr. Gaillard recommends its use in cases of *dangerous salivation.* The only effect it could have, according to the views of the European chemist, under such circumstances, would be to increase the mischief, for, if any insoluble compounds were deposited in the system, they would be at liberty by the salt and would be equivalent to so many additional fresh doses of mercury. It is familiar to every one that after a protracted course of mercurials, say in a case of syphilis, for example, the administration of iodide of potassium suddenly produces the salivation which the mercury had failed to accomplish. It could hardly act in this manner, except by setting at liberty the insoluble compound of quicksilver which had accumulated in the system.

A Paper on the Effects of Lead on the Heart. By John W. Carson, M. D., New York, 1856.

This very valuable paper contains the history of ten cases of lead poisoning, studied with especial reference to the influence of that cachexy upon the heart. The action is that of a sedative, as shown by diminution of

the force of the impulse, faintness upon exertion, occasional attacks of alarming syncope sinking palpitation, and a slow, soft, compressible pulse. We commend the paper to the careful perusal of all interested in the study of lead poisoning.

Narrative of a Journey to the Summit of Mont Blanc. By Wm. Howard, M. D. Baltimore, Lucas Brothers, 1856.

Dr. Howard, a gentleman highly esteemed in this his native city, was one of the few travellers who have ever stood upon the summit of Mont Blanc. The mob of tourists who prattle about ascending this "monarch of mountains," halt far below the top. The first real ascent was made by Jacques Balmut and Dr. Paccard, of Chamouni, in 1786. Dr. Saussure was the next who accomplished this feat, and he published a glowing account of the ascent. After this, several parties made this difficult and dangerous trip. Drs. Howard and Van Rensselaer were the first Americans who ever reached the summit of this famous mountain. They went up together in July, 1819, and the book before us is a graphic and entertaining account of their expediiion. They suffered, as all tourists, who attempt to climb Mont Blanc, suffer. Their eyes were inflamed, their faces blistered.

MISCELLANEOUS NOTICES.

Resignation.—It will be seen by the following letters and resolutions that Prof. A. A. Blandy has resigned the chair of Practical Dentistry in the Baltimore College of Dental Surgery.—Eds.

Baltimore, March 5th, 1856.

Prof. P. H. Austen,

Dear Sir:—Permit me, through you, as the official organ of the Faculty of the Baltimore College of Dental Surgery, to tender my resignation of the chair of Practical Dentistry in said institution. The time required to attend to its duties, from 9 A. M. to 12 o'clock, five months of the year, is more than I can spare from the practice of my profession, and hence I feel myself called upon to sever the pleasant relation which has so long existed between us.

Wishing the Faculty abundant success in their arduous and praiseworthy labors. I have the honor to be very sincerely and truly,

Yours, ALFRED A. BLANDY.

Baltimore, March 8th, 1856.

Dr. A. A. Blandy,

Dear Sir:—In accepting the resignation tendered in your letter of the 5th inst. the Faculty request me to express to you their sincere thanks for the warm interest you have ever manifested in the welfare of the College, and for the sacrifices made by you in furtherance of its success. We regret that any circumstances should have determined you to withdraw from official relations, that have been uniformly marked by harmony and friendly feeling. Permit us to hope, that in the midst of your increasing professional cares, you will preserve an undiminished interest in the future welfare of an institution, whose Faculty desire here to acknowledge her many obligations to you.

I have the honor to be your most obedient servent,

P. H. AUSTEN, *Dean of the Faculty.*

At a meeting held by the graduating class of the "Baltimore College of Dental Surgery," Feb. 22nd, 1856, the following proceedings were had:

Geo. C. Lewis was called to the chair and J. W. Whitmore appointed secretary; when Mr. B. H. Padgett briefly explained the object of the meeting, and offered the following preamble and resolutions, which were afterwards adopted by the class:

Whereas, we have learned with regret of the withdrawal of Dr. A. A. Blandy from the professorship of Dental Practice in the Baltimore Dental College, therefore, be it

Resolved, That his efforts to sustain the reputation of the Infirmary, and the impartial and instructive labors he has bestowed in this department, met with our hearty approval.

Resolved, That in retiring from this worthy position, which he has so ably filled, he has our warmest sympathies and best wishes.

Resolved, That a copy of these proceedings be signed by the chairman and secretary, and transmitted to Dr. Blandy, and also one to the Editors of the American Journal of Dental Science.

On motion, the meeting adjourned "sine die."

GEO. C. LEWIS, *Chairman.*

J. W. Whitmore, *Secretary.*

Appointment.—The friends of the Baltimore College of Dental Surgery, will be gratified to learn that the chair of Dental Practice, vacated by the resignation of Prof. Blandy, has been filled by the appointment of Dr. Maynard, of Washington city—a gentleman well known as one of the most distinguished practitioners in the profession.

It will also be seen by the advertisement of the Session for 1856-'7, that the Faculty have created a Lectureship of *Microscopic and Comparative Dental Anatomy*, which has been filled by the appointment of Dr. Christo-

pher Johnston—a gentleman eminently qualified to give a thorough course of instruction in these highly interesting departments of science. By this last appointment, the curiculum in the Baltimore College, has been somewhat extended and rendered more complete.

Baltimore College of Dental Surgery.—The sixteenth annual commencement of the Baltimore College of Dental Surgery, was held in the Assembly Rooms of the College, on the evening of the 4th of March. The exercises were opened with prayer by the Rev. Dr. McCabe, after which was read by the Dean, the following list of graduates, with the subjects of theses.

Asa Holmes Balderston, Baltimore, Md., Anatomy and Physiology of the Human Economy.

Samuel A. Bruce, Farmville, Va., Odontrophy.

Thomas J. Corpening, Morganton, N. C., Effects of the Retention of Carious Teeth.

Richard C. Cyphers, Woodbridge, N. J., Vitality.

William F. Edington, Dundee, N. Y., Dental Caries and its Treatment.

William H. Hoopes, Baltimore, Md., Dental Physiology.

Charles M. King, Philadelphia, Pa., Arsenic.

Joseph M. Lauck, Washington, D. C., Extirpation of Dental Pulp.

George C. Lewis, Raleigh, N. C., Abscess.

George W. Neidich, Carlisle, Pa,, Irregularities of the Dental Arch.

Berrymon H. Padgett, Hicksville, N. C., Preservation of the Teeth.

Christopher W. Reed, Wincheter, Va., Dental Hygiene.

R. Bruce Reynolds, Philadelphia, Pa., Mercurial Stomatitis.

Edward W. Swentzel, Lancaster, Pa., Inflammation of the Mouth.

Thomas O. Walton, Annapolis, Md., Saliva.

Elias Weiler, Belleville, Pa., The Teeth.

John W. Whitmore, M. D., Houston, Miss., Difference between Bone and Teeth.

The Graduates then received their Diplomas from the President, and were afterwards addressed by Dr. Solyman Brown, of New York City. In concluding this address, which will be found in the present number of the Journal, Dr. Brown offered three knotty problems for solution: viz. 1st, "Why does the melted wax of the common honey bee, when allowed to cool slowly in a thin stratum, assume geometrical forms of the same average size and shape of the alveoli of the comb from which the wax is derived." 2nd, "Why do all the colors of the solar bow, or prismatic spectrum which is simply an analysis of the sunbeam, from black to white, namely, red, yellow and blue, with all their shades and combinations, enter as pigments into the human hair, blue only, excepted?" 3rd, "Why did the healing art, including medicine and dentistry, have, in

darker ages of the world, a greater proportion of *quack* practitioners than any other art or science?" After the conclusion of the address, Prof. Thomas E. Bond, at the suggestion of one of the faculty, arose and gave the following impromptu solutions:

Once upon a time, when, as in the present instance, a large audience had listened to an address by a remarkably eloquent speaker, a gentleman arose and observed that, *inasmuch as the audience seemed reluctant to disperse he would make a speech.* A most sagacious resolution, as certainly it was the readiest way to accomplish the dispersion. In like manner and perhaps for similar reasons, I have been requested to add a few words, (by way of putting you in a humor to go home.) In one respect, I have the advantage of the gentleman who has just addressed you—I am not restricted to '20 minutes and no poetry;' indeed, if I were, I think I might transgress and yet follow in the path of safe precedent. My good friend, the doctor, contrived to occupy a good deal more than the time prescribed, (and I am glad that he did,) and I am by no means sure that he did not give you some poetry. If Maud and Hiawatha be poetry, I am rather inclined to think we had some to-night. For modern poetry seems to have become independent of versification. Dr. Brown professed to be an 'old fogy,' and gave you a philosophical definition of the term. If this definition be admitted, I confess that we have had a brilliant display of 'old fogyism' to-night. The glorious sun never seems so resplendant, as when bursting through a mass of clouds, he throws his radiance upon the darkness behind him, and projects his brilliant rays into the clear atmosphere beyond; and certainly, *Old Sol* never exhibited greater brilliancy than he did to-night, when emerging from the fogs of immature life, he threw a flood of light upon the obscure past and into the brighter future.

In taking leave of you, permit me to avail myself of certain enigmas which my worthy friend threw out for solution. I think that he took us at unfair advantage, because in the relation we occupy to you, it is, of course, impossible for us to admit ignorance of anything, and really, a few minutes are scarcely sufficient for the making or solving riddles like these. Yet I must venture. Well, the first was the query about wax. 'Why does melted wax, in cooling, show a tendency to assume the form of its original comb-cell?' In the first place, I am forcibly reminded of a story about a problem, that was said to have been submitted to a learned body, to ascertain why a dead fish weighed more than a living one. After a good deal of scientific discussion, somebody suggested that it might be well to verify the fact before they should explain it, and on weighing, no difference was found to be observable. But admitting the wax story, which I do not vouch for, how can we explain it? Obviously it seems to me, the conduct of the wax is the result of habit. And here let me urge upon you an important moral. If wax, of all things most pliable and plastic, and easily modified in form; if this most tractable of substances, even after

having been subjected to the fiery ordeal of a furnace, and reduced to entire change of form; if even wax, from force of habit, nevertheless, gets back to its old condition, what suppose you is likely to be the force of habit in the human mind; so self-willed, so subject to the power of memory and association—so intractable as it is? Now here is the mythical wisdom, which I suppose our learned friend has wrapped up in the wax. At any rate, it is an instructive illustration, and an 'old fogy' myself, I can from experience, assure you that the bad habits inadvertently or foolishly formed in youth, are the great difficulties—the inconsolable regrets of later life.

The next riddle given us for solution, was to explain the parsimony of nature in the use of 'blue' in the coloring of man. The reason of this is very plain. Obviously, nature never intended man to be *'blue.'* There is no use in being *'blue'*—no effect comes of it—no end is accomplished by it. Better have anything else than have the 'blues.' The man who despondingly sits down to ponder over evils and discount coming trouble, is of very little use to himself or others. We are not providences but there is a great and wise Providence over us. With this trust in our hearts, we may fearlessly and hopefully meet the future. Cheerfulness is necessary to successful effort. Nature did well to put so little *blue in us.* Some of us have too much, notwithstanding. So here is another myth unravelled, and a pretty myth it is.

The third problem, we can only make a feeble attempt to solve, and I must help cut the solution by a story.

Some years ago an atheist in this city—for there are such people in the world, who do not know how they came here, or what they are for, or who is who or what is what—well one of them came to his senses and determined to renounce his unbelief publicly. After doing so, he observed that probably his old friends might like to know which of the Christian sects he intended to join, and he had only to say, that he intended to join the one in which he should find the most hypocrites: for said he, men do not counterfeit base coin—upon this principle perhaps it is that there are so many counterfeiters of medicine. The purity of its truth tempts to dishonest pretension.

And now, gentlemen, you are going forth to practice your profession, and I am glad to believe that you will start in life with more than ordinary prospects for success. Remember however the remarks about "success" made by the orator of the evening. Wealth is not success. We have abundant evidence of this. We see many men who have spent years in destroying their sensibilities, in order to accumulate wealth: but surely these men are poor examples of a successful life. Do not fail as they have done. The word "failure" when applied to the result of human life is an awful, a terrible word. To fail in the use of a preliminary and probationary life: to fail in view of eternal results: to fail irremediably—these are

fearful thoughts: yet men all around you are so failing, and so will you, unless you at once form right views of the end to be attained and set yourselves resolutely, humbly, and cheerfully to accomplish them.

Operations performed in the Infirmary of the Baltimore College of Dental Surgery, during session 1855-'56.

Medical and Surgical Department.

Extraction of teeth	2430
Fillings (crystal gold, gold foil and tin foil)	965
Do. over exposed nerve	9
Do. to extremity of fang	8
Superficial caries removed	98
Cases of removal of tartar	35
Do. do. diseased gums	30
Do. do. irregularity	3
Pivot teeth	15
Disease of maxillary antrum	1
Fungous tumor of the upper jaw	1

Mechanical Department.

Double sets, 9	18
Full upper sets	19
Full lower sets	5
Partial upper sets	18
Partial lower set	1
Total number of pieces	61

P. H. Austen, *Dean of the Faculty.*

In the above statement no account is taken of experiments made by students in filling teeth *out* of the mouth; or of a very large number of experimental pieces made not to be worn by patients, but to give practice in the various mechanical details.

Philadelphia College of Dental Surgery.—The last commencement of the above Institution, was held the 27th of February, at which time the following gentlemen received the degree of *Doctor of Dental Surgery*. The valedictory was delivered by Prof. Flagg.

J. Canning Allen, Jr. Wm. T. Arringeon, James P. Broun, Charles H. Burr, Louis Martin y De Castro, Antonio L. Coopat, Francis Field, J. Foster Flagg, James E. Garrettson, William Grimes, John W. Hunter, Jose G. Lopez, Samuel Martin, M. D.,

A. F. McLain, Robert L. McClellan, Charles Neil, M. D., Henry B. Parry, Alan W. Read, W. Bartling Robbins, R. Woodward Robinson, John Z. Stanger, James K. Whiteside.

We copy the following from the New York Dental Recorder: the editor of which was present on the occasion.

The following is a record of the operations performed in the infirmary:—

Demonstrator's Reports.—Session of 1855-'6.

Operative Department.

Fillings	562
Treatment of "nerve," (cases)	84
Extraction of teeth and roots	723
Superficial caries	2
Removal of salivary calculus, (cases)	27
Pivot teeth set	7
Total operations	1405

Louis Jack, *Demonstrator.*

Mechanical Department.

Entire sets of teeth	3
Partial sets	16
Total of teeth inserted	163

W. Calvert, *Demonstrator.*

R. Arthur, *Dean of the Faculty.*

It will at once be seen that in Dental Colleges students have opportunities of witnessing and performing many more practical operations on the teeth, in the course of a few weeks, than they could possibly hope to meet with by remaining years with the most competent teacher, even were he backed by the most complaisant of patients.

During the commencement exercises, an incident occurred that struck us as being something novel in the history of Dental Surgery.

The President (we presume) of the Board of Trustees or Corporators read the authority for conferring the degrees, and handed the diplomas to the Graduates. After they had all been conferred, and the Graduates had resumed their seats, the President announced that the Honorary Degree had been conferred upon two persons, stating their names and residences, which we have forgotten, (further than that they lived in that small part of the State of Camden and Amboy known as New Jersey.) The peculiarity of this procedure consisted in the neglect, on the part of the President, to state that these Honorary Degrees had been conferred upon the said parties by the Board, and against the wishes of the Faculty, who had, we understand, entered their protest against any such action.

We learn that among the board of corporators there is but one dentist to be found. The faculty of the colleges are, on the contrary, all practical and practicing dentists. They are considered as the responsible parties by the profession, and are unquestionably the only persons connected with the institution who can be considered as judges of professional ability. Looking at the question in this light, we must confess that the action of the board of corporators argues for them an amount of presumption and a want of principle that might be expected among politicians, but that no one would look for among the trustees of a scientific or literary institution. Of course, no gentleman could accept a degree conferred under such circumstances.

After the commencement exercises were over, the guests, students, &c., adjourned to Parkinson's, where a collation was disposed of in a manner satisfactory to all parties. A number of speeches were made, and the evening passed of very pleasantly.

Prof. Arthur took occasion, in a very frank and manly address, to protest publicly against the procedure of the board of corporators alluded to above. His remarks were received with unqualified applause and an enthusiasm which evinced most satisfactorily that the sympathies of the dental profession were on the side of the faculty.

We have since learned that at a special faculty meeting, held on Monday evening last, the faculty resigned. This seems a most summary method of blotting a very flourishing institution out of existence; but we do not see that any other course was open to them.

If the board of trustees had the power and inclination to grant degrees against the wishes of the faculty, they would soon begin to refuse degrees to those whom the faculty thought were entitled to them. The truth of the matter is, that the odium of the ruin of the school must rest upon the heads of those who by their most unwarrantable and unprincipled behavior, have compelled the faculty to make choice between their self-respect and their position in the college. Their action in the matter merits the thanks of the dental profession.

American Medical Association.—The ninth annual meeting of the American Medical Association will be held in the *City of Detroit,* Michigan, on Tuesday, May 6th, 1856.

The secretaries of all societies and other bodies entitled to representation in the association, are requested to forward to the undersigned correct lists of their respective delegations, *as soon as they may be appointed;* and it is *earnestly* desired by the committee of arrangements, that the appointments be made at as early a period as possible.

The following extracts are from article 2d of the constitution:

"Each local society shall have the privilege of sending to the association one delegate for every ten of its regular resident members, and one for every additional fraction of more than half this number.

"The faculty of every regularly constituted medical college or chartered school of medicine, shall have the privilege of sending two delegates. The professional staff of every chartered or municipal hospital, containing a hundred patients or more, shall have the privilege of sending two delegates; and every other permanently organized medical institution, of good standing, shall have the privilege of sending one delegate.

"Delegates, representing the medical staff of the United States army and navy shall be appointed by the chiefs of the army and navy medical bureau. The number of delegates so appointed shall be four from the army medical officers, and an equal number from the navy medical officers."

The latter clause, in relation to delegates from the army and navy, was adopted as an amendment to the constitution, at the meeting of the association held in New York, in May, 1853.

*** Medical Journals, &c., please copy.

William Brodie, M. D., Detroit, Mich.,
One of the Secretaries.

Aluminium cr Aluminum.—The senior editor acknowledges the kindness of Messrs. Charles Abbey & Sons, from whom he has received a few sheets of foil prepared from this newly discovered metal. He has been enabled to experiment sufficiently to convince him that a good filling can never be made with it; and that in this department of dentistry, it can never compete with gold. In the department of dental mechanics, however, we think it may be destined to play an important part: and we await with much interest the result of certain experiments to be made by Professor Austen, who has ordered a supply of the metal from Paris.

Our readers will find in the present number a very interesting article upon aluminium. We also subjoin the letter of Messrs. Abbey & Sons; it presents, very clearly, one of the properties that unfit it for use as foil.

Philadelphia, Feb. 23, 1856.

Dr. C. A. Harris, Baltimore, Md.

Dear Sir:—Enclosed please find a sample of foil made of aluminium. The attention of scientific and practical men has been strongly directed, within the last two or three months, to this metal, by recent discoveries by certain French chemists, of increased facilities for producing the metal, and the confident expectations held forth, that it will be still more abundantly produced by further discoveries. It is claimed for aluminium that (when it shall become more abundant) it will be a substitute for gold and silver in many of the trades, &c., in which those costly metals are now used, and it has been suggested that it will prove well adapted to the uses of the dentist. With a view to give some of the inquiring, thinking men of the profession an opportunity of testing how far it is adapted to their use for "filling cavities" in teeth, we have embraced the first opportunity offered of pro-

curing a specimen and working it into foil for distribution. We were enabled to obtain but a small quantity, our entire lot for distribution consisting of less than 100 leaves, hence we send you no larger sample than the enclosed half dozen. We find the metal tolerably kindly, a little disposed to be harsh, or "sort of stiff," but still ductile, and to a considerable degree tough, color maintained without change, throughout whole process of reduction from original ingot to foil, inclined to be scaly, as you may see, caused by its lacking that quality in gold of "uniting," or as we may express it, "welding" together during "beating," when it has become broken or seems opened in it by carelessness or accident in that process. In gold the seams or fracture may be joined together ("closed up" is the technical) under the hammer so as to be unseen, but the aluminium does not unite, the edges of the fracture will overlap and continue to spread under the hammer in two thicknesses. More explicitly, two sheets of gold foil laid one upon the other may be inseparably united by "beating;" but two of aluminium will remain two, all the time. The enclosed foil is *thicker* probably, than what you ordinarily use, but the average weight of each sheet is about 2½ grs. The specific gravity is represented to us as about one fourth that of silver. Each sheet has been annealed to a dull red heat, melting easily beyond that. When it shall be well ascertained that aluminium undergoes or causes no change in the mouth, we think it will prove a valuable substitute for gold and silver plate in mechanical dentistry.

Yours, respectfully, CHARLES ABBEY & SONS.

Baltimore Dental Depot.—Mr. Snowden, of Baltimore, has recently opened a depot, corner of Market and Eutaw streets, for the accommodation of the dentists of Baltimore, as well as those visiting the city for the purpose of supplying themselves with porcelain teeth, gold, platina, instruments, &c. In short he proposes to keep all the materials used by the profession, and will furnish them on as reasonable terms as they can be procured in Philadelphia or New York. Having obtained the agency for the sale of the teeth made by the New York Teeth Manufacturing Company, he is supplied with a large and beautiful assortment, which for natural appearance and strength are equal to any we have seen. He also keeps the various patterns of files manufactured by this company, which in some respects are superior to any we have ever used.

The want of a dental depot in Baltimore has been long felt, and now one is established, we trust it will be sustained by the profession of the city.

New York Teeth Manufacturing Company.—The senior editor is indebted to Mr. Crowell, one of the actuaries of this enterprising company, for several samples of their dental files, which are equal in quality to any

which he ever had from Stubb's establishment, of England, while the patterns are more numerous and better adapted to operations on the teeth. He feels confident they will receive the approbation of all who use them. He has also had an opportunity of examining some of their plate teeth, which are very beautiful, and admirably adapted to the various methods of mounting.

Dentists Soldering Lamp.—Mr. T. J. Haskell, dentist, of Philadelphia, has recently constructed a soldering lamp, possessing several advantages over those usually employed for the purpose. It will hold about a pint of alcohol; upon the top a piece of slate is let in for grinding borax, as well as a place for the borax and solder. To the back part of the lamp there is a cup for water and a match box at the side. Near the spout for the wick is, what we presume is intended for a ventilator or escape pipe for any steam which may be generated inside while soldering. We do not, however, perceive that this can be of any particular advantage, as this will pass off through the wick-spout as generated; besides, it seems to us, though we may be mistaken, never having used the lamp, that the flame might be communicated to the alcohol within through this tube. This, however, might be easily prevented by closing the tube. There is also a place on the side for pouring the alcohol into the lamp.

Medico-Legal Importance of Cicatrices.—By Schneider.—The appearance of cicatrices is important in medical jurisprudence, inasmuch as it depends on the nature of the injury received, and on the sort of instrument by which it was inflicted.

Cicatrices after incised wounds, when these have been properly treated and there has been no deep-seated suppuration, generally present a more or less rectilinear form. But the elasticity aud stretching of the skin, the convexity of the subjacent parts, and the softness of the cellular tissue, may change a rectilinear cicatrix into an elliptic, or even into a circular one. *Cicatrices from stabbing instruments* are often of a triangular form. Those from *gunshot wounds* are generally of a rounded or grooved character. If the shot has been received from some distance, there is a considerable mark (*scheibe*) with depression of the skin in the centre, and puckering at the margins; if the shot had been fired close at hand, the cicatrix is deeper, its edges are irregular, and it is of a bluish color. In wounds of this description, also, the point of entrance of the ball is shown by a depressed, and the point of its exit by an elevated cicatrix. *Bruises,* when unattended with lesion of the integuments, leave no cicatrix; but when occurring with this complication, they leave cicatrices resembling those

caused by incised wounds, or injuries accompanied with loss of substance. *Bites of mad animals* are distinguished by no peculiarity of scar. *Burns* of the first, or minor grade, leave no mark; those of the second grade occasion scars like those of blisters; those of the third grade cause white, glistening, and tolerably smooth cicatrices; and those of the fourth, or most severe grade, leave dense, hard, irregular, contracted cicatrices, with abnormal union of approximated surfaces, and very great retraction of the cellular tissue. *Fluid cauterants* give rise to superficial, and *solid cauterants* to deep circumscribed cicatrices, with contracted centres, and these may in certain cases be variously colored by the chemical nature of the irritant substance. *Scrofulous ulcers* leave cicatrices which are irregular and furrowed, with smooth deep depressions, and surrounded by hard uneven margins. The *scorbutic cicatrix* is dark bluish-red in color, soft to the touch, somewhat elevated, and rather painful; in course of time it becomes flatter, of a reddish brown color, approaching to green in the centre, and very thin and easily injured. *Arthritic scars* are of a reddish brown, a bluish, or an ash-gray color; they are studded with elevations and depressions; while their circumferences are dark brown, varicose, and often inflamed and erysipelatous. *Herpetic cicatrices* are wider spread, irregular, superficial, and of a dirty reddish-brown color; in the centre they are often of the same color as the old skin, and they gradually merge into the surrounding integuments. *Syphilitic cicatrices* are characterized by great loss of substance; they approximate the lips of the deep ulcers before their granulations have had time to reach the surface. *Glandular cicatrices* are irregularly tumefied; generally deep, hardened, and of a reddish-brown color. The cicatrices of *true smallpox* are flat and irregular, with indented margins, giving to the surface the appearance of a citron; while those of *pseudo-variola* have smooth even borders, and have hairs growing in them.

As regards the *age of a cicatrix,* we must be guided by its color, size, and thickness, in forming of our opinion. The fainter its color, the larger its extent, and the greater its sensibility and tenderness, the more recent is its formation, and the more imperfect is its organization. As its age increases it grows smaller, thicker, more shining, and less sensitive.—*Monthly Journ. Med. Sci.,* Oct. 1854, from *Prag. Viertaljahrs.* Bd. ii, 1854.

A Gold Filling Removed from the Neck.—A lady in Tennessee, had a gold filling, about the size of a squirrel shot, recently removed from the side of her neck, immediately beneath the angle of the jaw. She was ignorant of the manner in which it got there, but it probably escaped from one of her teeth while eating and lodged in the fauces or a fold of the mucous membrane of the lower part of the mouth, and from thence made its way to the place from which it was removed.

Triumph in Dentistry.—A professional friend writing to the senior editor, states that a dentist of the state of New York, has attained to such perfection in the use of crystalline gold, that he can build on to the roots of a firmly articulated molar, an entire crown, uniting it to them so firmly that the tooth may afterwards be extracted by the application of forceps or a key to the artificial crown. The next time we hear from our correspondent, we shall expect to receive the gratifying intelligence that some of our progressive brethren at the north have succeeded in replacing with gold, roots as well as crowns, of recently extracted molars, to answer a better purpose than masticators supplied by nature.

Killing two Birds with one Stone.—A new method of economising time in operating on the teeth was mentioned to us a few months since by a professional friend of New Orleans. A gentleman, suffering from pain in a tooth, applied to a dentist in the south for relief, and not being willing to submit to the loss of the organ, the decomposed portions were partially removed, and arsenious acid applied to the bottom of the cavity on a bit of raw cotton. This done, the operator at once proceeded to fill the tooth with gold, assuring his patient that the pain would entirely cease in a few hours. The prediction proving correct, the gentleman supposed he had been peculiarly fortunate in securing the services of a most skillful practitioner, nor was it until several weeks had elapsed, when his tooth again become troublesome, that he became aware of the malpractice to which he had been subjected. He now applied to the professionalgentleman, to whom we are indebted for the particulars of the case, who, on removing the filling discovered the imposition that had been practiced upon his patient.

A Valuable Bucket.—Among the many modes of making money here, none, I think, surpasses the following: A surgeon told me he went one day into the tent of a brother medicus, on the Bendingo, just as a patient was going out, "I have been stopping a tooth," said the surgeon. "Do you get good cement here?" inquired my friend. "Admirable! I saw an old gutta percha bucket selling in a lot of tools one day at an auction. I bought the lot for the sake of the bucket, which cost me five shillings. I have already stopped some hundreds of teeth with the gutta percha at a guinea each, and shall, no doubt, stop thousands with it before the old bucket is used up. It is a fortune to me. My name is up for an unrivalled dentist, and they come to me from far and near."—*Two Years in Victoria.*

Wanted.—Ths senior editor wishes to purchase the *first volume* of the first, or old series of the Journal, for which he will give $5 00. He wants No 1, of vol. 2; No. 3, of vol. 7, and No 1, of vol. 9, for which he will give $1 25 a number. He will also pay the same price for No. 1, vol. 1, and No. 2, vol. 2, of the new series.

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ORIGINAL COMMUNICATIONS.

ARTICLE I.

Disease of the Mucous Membrane of the Mouth and Alimentary Canal a Cause of Disease of the Teeth, Gums and Alveolar Processes. By A. A. B.

All morbid influences acting upon the tissues of the mouth effect an alteration in the various secretions which lubricate the teeth, constituting a fearful, and the chief, cause of their destruction.

It becomes most important to know the influences producing such effects, and to have a thorough comprehension of the pathological changes of the general system, as well as of the local parts, to enable the practitioner to administer suitable remedies. Believing that these considerations are not generally recognized, and much experience, with continued observation, forcing a conviction of their necessity upon me, I have chosen this subject for a paper in the Journal, trusting that the observations made will elicit further communications from abler pens upon the same topic.

In many diseases we can trace with absolute certainty that their immediate baneful effect is in the mouth and subjacent

tissues, evident in parotitis, when, not unfrequently, the entire glandular system of this part is involved, and sometimes becomes a diffused inflammation of the entire mucous membrane.

Again, in tonsillaris, it is difficult to find any solution to the induction of the disease to these glands, except through the agency of the mucous membrane, and to which the curative treatment is principally addressed. Observe, in its grave types, how it creeps to distant parts—the whole of the fauces becoming a sloughing surface, the entire mouth is gradually encroached upon; then the disease finds its way down the esophagus, ulcerating the eustachian tubes to the ears; in fact introducing disease along the whole course of the alimentary canal.

Laryngitis presents equally startling facts, through inflammation of the mucous membrane. It makes its approach with the symptoms common to most of the inflammatory fevers, chilliness, heat, &c., followed by a changeable, indistinct voice, viscid mucous secretions, gradual swelling of the tongue, face and eyes, the fauces red and turgid, implicating the tracheal and bronchial vessels, vitiating their secretions, so as to produce, in some cases, strangulation from its filmy nature.

In bronchitis, we have a much more serious difficulty of this kind, as it is generally experienced in a chronic form, sometimes of extreme duration, lasting through the life of the individual. It is a common error to believe that, in most instances of this disease, the bronchial tubes are alone implicated; the inflammation generally spreads, by means of the mucous membrane, over the whole range of the windpipe, including the larynx and the most intricate ramifications of the bronchia. The gums, and even the glands of the mouth, are most frequently found to partake of the inflammation, changing the nature of the secretions into acrid and vitiating matter, producing caries and erosion of the teeth, and often absorption of the alveoli.

Close observation will, in numberless cases, enable one to detect this result in chronic bronchial irritation; delicate chemical tests, by skillful manipulations, will confirm the opinion be-

yond all doubt or controversy; and although the mucous secretions, found in the larger parts of the tube, are said to consist entirely of the gluten, or coagulable lymph of the blood, together with slight traces of serum and fibrin, that of the salivary glands will be found, most generally, to have changed its alkaline to an acid character. In the origin of this disease, the lining membrane of the mouth will be found alternately pale and livid, slightly swollen, attended by heat and dryness, which, gradually descending, fixes itself in the trachea, where it results in engorgement, as before mentioned, or in a dry, hacking cough. In the young, it assumes, almost invariably, the acute form, exhibiting itself in catarrhal fever, attended, not unfrequently, by violent spasmodic action, or dry and ineffectual coughing.

Dr. Cullen, treating of peripneumonia and pleurisy, distinctly asserts, that one of the chief causes is the application of cold to the mouth, attended with the general concomitants of inflammation; and although a general idea prevails that persons suffering under any of the forms of phthisis are peculiarly exempt from diseases of the mouth, I have never found it verified by observation. On the contrary, I have frequently witnessed a diseased condition of the mucous membrane of the mouths of patients laboring under pulmonary troubles, indicated by a pale anæmatous condition of the gums; the apices between the teeth are often red and slightly swollen, but not so subject to hemorrhage, or as sensible to mechanical contact as in other morbid conditions. The salivary secretion becomes frothy, and sometimes even glutinous; refuses to mingle with the mucus, somewhat similar to its condition in mania, inebriation and hydrophobia. One patient, particularly, was compelled to cleanse the mouth every few minutes from the sputa collected, which retained, became extremely offensive.

There can be little doubt concerning the intimate relationship existing between the condition of the lungs and the mucous membrane. It is conceded that pulmonary diseases, when hereditary, are strongly indicated by many symptoms, and by none more than by the size, color and consistency of the teeth,

the most remarkable appendages of the mucous membrane, and that their texture and health, under these circumstances, must be changed, is an unavoidable conclusion. A further proof of this fact is fully presented in the history of a patient, who was subject to frequent attacks of pneumonia; during such times as the disease was present, the fauces, uvula, and soft palate became injected with blood, so as to be covered with patches of a deep red color; the little capillaries were completely congested, radiating from and interlacing the edges of these patches, giving a painful soreness to the parts and much inconvenience in swallowing. Before the age of thirty, the teeth had all been sacrificed, from the acidulated condition of the juices of the mouth. After their removal, the same phenomena supervened, the gums becoming sore and swollen as before, and again returning to a healthy condition upon the cessation of the cause originating the disturbance.

In many cases of asthma, we cannot perceive any other trouble than an irritated condition of the mucous membrane lining the mouth, bronchia, &c.; although the frequent absence of viscid mucus would lead to the idea that it was more of a spasmodic nervous affection—a disease operating upon the subtissues; but from the fact that relief is only had after a free exudation of mucus, we are again brought to the conclusion that this membrane is most particularly at fault.

Nor is this view impaired in the least from the fact that asthma is frequently a sequel of many other diseases, as in rheumatism, pleurisy, cutaneous eruptions, or habitual discharges, as in hemorrhoids, or from a transfer of morbid action, for still it is found to attack this membrane. In a contra view, patients subject to it are, in some cases, instantaneously attacked from inhaling some noxious vapor. The atmosphere being impregnated with odorous essences, its occurrence in some fogs and mists, and its relief by this agency at other times, confirms the opinion that it must reside in the mucous membrane.

It is still more evident in the almost universal treatment prescribed. Squills, as a powerful expectorant, is also the most

active stimulant of the mucous membrane, giving relief to the whole excernant system, by increasing the discharge of mucous; so with seneca root, a sort of general evacuent, but which always promotes the secretion of mucus, both being generally employed after the use of calomel or some other cathartic. Counter irritants, in this disease, act beneficially, by withdrawing the morbid influence from this membrane, until by the forementioned or other genial stimulants, its healthy secretion becomes restored, to the relief of the whole pulmonary apparatus.

We enter now upon a more common and better understood disease—gastritis; one in which the morbid effects upon the tissues of the mouth are recognized, not only by physicians and dentists, but by the patients themselves,—which has led to the error of referring almost all the diseases of the teeth too generally to this fruitful source. The immediate connection of the mouth and stomach is not of a closer intimacy than that subsisting between the mouth and the lungs, the bronchia, or in fact of any intervening part or passage whose surface is lined by the mucous membrane,—the only difference being in the greater extent and greater frequency of disturbed action; for it must be borne in mind that it is a membrane embracing, in various forms, all parts of the body, and from its great vascularity and large supply of the nervous filament, endowed with an unusual power of transmitting impressions to distant parts, and of sympathising with even remote organs, when suffering from disease.

In the buccal cavity, this condition of structure is still more exalted. The unceasing change of temperature, the perpetual contact of acrid and stimulating matter, the poisonous influence of miasmas, of whatever nature they may be, or whatever part of the system they may attack, produce their various morbid phenomena through the mucous membrane or its secretions. Indeed there can be little doubt but that the invisible agent, malaria, and even the poison communicating the various epidemics, as yellow fever, cholera, &c., accept of this agency to convey to the nervous system and blood its morbid influences,

clothing and protecting as it does, by its peculiar fluid, all the vital organs of the system.

The stomach is a great centre of sympathy and of acute sensibility; it is hence impossible for inflammation to attack it without great suffering, and without extending its influence very widely. Gastritis is invariably accompanied by fever, and is generally characterized by an inflammatory color of the fauces, usually extending down the esophagus, and in many cases pervading the greater part of the alvine canal. The mucous membrane of the mouth is always affected in this disease; indeed, the surface and edges of the tongue give the most reliable indication of the state of the stomach, whenever any disturbance exists there; its middle and posterior surfaces are usually covered with a whitish fur during the first period, and in many cases before the disease has fully developed its character. Should the attack be slight, this appearance may remain unchanged; but when it becomes severe, the edges will be red, and sometimes swollen, while the papilla will protrude inflamed points through the furred surfaces, and the whole organ become dry and extended. When the disease becomes unfavorable to any treatment, the tongue throws off these peculiar conditions, and assumes a smooth red surface; is dry—becoming gradually covered with a thrush-like exudation; the skin becomes cool and pale; the mucous, which before had been ejected of a natural color, is now entirely changed to a blackish looking matter; the whole system sinks rapidly and death supervenes.

The chronic form of this disease is said by a celebrated writer to approach so gradually that it seldom attracts the serious attention of the patient, or comes before the notice of the physician until it has existed a considerable period; but during this time the mucous membrane is becoming more and more affected, with but little indication of this condition, except it is by a "sense of heat or burning, extending up the esophagus, over the chest," and the left side particularly, says the author before referred to. At first this is unattended by any eructations, but gradually, small quantities of gas, sometimes inodorous, at others offensive and irritating, are thrown off, accompanied by

sour and acrimonious fluids. Frequently, the glairy, mucous secretions of the stomach and alvine canal are thrown up, along with the gas and fluid before mentioned. In the latter stages, the throat becomes excoriated, and not unfrequently blood is passed along with the food, bile, mucous, sour and acrid fluids, mixed it may be with these, or with the gastric juice.

In the meantime, the mouth is prominently affected, and treatment is always addressed to relieve the distress occasioned by it. In chronic gastritis the duration of the disease is such, and its progress so irregular, that patients often imagine themselves cured when a mere change of diet or sudden exposure will produce a recurrence; in fact, many inappreciable causes will arouse it to full force again, showing that its violence had only been subdued, and that it still lay dormant in the stomach. This state is characterized by derangement of the secretions, which empty upon or through mucous surfaces, especially those of the mouth; the saliva being found to be almost invariably acidulated; at times excessively abundant, even in some cases to salivation; at others it is found deficient in quantity, and still more acrid in quality, more particularly the fluids secreted by the sublingual and submaxillary, which partake more largely of this trouble than the parotids, which seem from their peculiar location, to be more exempt from disturbances arising from affections of the mucous membrane than the other large glands of the mouth. These glands, with the submucous, are always in a diseased condition when the stomach is in any way deranged, and consequently the gums are in an unhealthy state, incapable of giving that support and protection to the teeth that is essential to the continuance of their health.

Through this cause they frequently become loose and elongated, and sometimes drop out of their sockets; at others, becoming the seat of such severe pain and bodily discomfort as to imperatively demand their removal. I have known whole sets extracted from this cause. The irritation thus communicated to the mouth, gums, &c., seems to find an inordinate predisposition to inflammation in the periosteum, which, in these

cases, terminates only in its entire destruction. I have often seen the most simple operations fail, being followed by the death of the organ, when performed during the existence of this disposition to inflammatory action in the dental periosteum, occasioned by gastritis; which operations, under a different condition of the system, would be unattended by any inconvenience or trouble.

The opinion that diseases take their allotted position in different parts of the body by some singular affinity or mysterious law of preference, seems to be peculiarly verified in this instance. Thus the stomach becomes attacked, and the mouth indicates it immediately by an inflammatory condition, retaining the morbid impressions not only during its existence in the primarily affected part, but long after it is the seat of any morbid action, and in fact appears as the immediate offspring of gastritis.

Dyspepsia is only another form of this disease, in which the irritation is of a very low order, and produced, not by any immediate action of some indigestible matter, or poisonous substances, but rather by continued depressing habits of body and mind, long indulged errors of diet, and by continued neglect of the premonitions of the appetite, as directed either to the amount taken, the time when, or of its analytical constituents, producing direct or indirect debility, generally by too great excitability from excessive stimulation. The mucous membrane is the first part to suffer; its villous coat becomes inflamed from the acrimony of the secretions, and from the inordinate and constant distention of the stomach by gaseous inflation, by the long detention of indigestible food, and by the perpetual efforts of the economy to overcome the evil, either by ejecting the matter, or by forcing it in an ill prepared manner into the vessels for distribution. The inflammation thus produced extends up the esophagus, as in gastritis, communicating this trouble to the mouth and its various integuments to such an extent, as in almost all cases to produce the decay of the teeth of such patients. Indeed, we may predict, with considerable certainty, their entire destruction.

It is not only from the consequences upon the mouth, as

communicating actual disease to its glands and secretive structure, that the destruction of the teeth is attributable—but to other and no less formidable ones; the regurgitation of half digested food and chyme, in such an acidulated condition as to act as an immediate decomposer of dentine. This offensive discharge into the mouth is, with many patients suffering from dyspepsia, a very frequent, if not constant habit. Not unfrequently the larynx and fauces become so irritated as to induce a constant attempt to clear the throat by coughing. The mucous secretion is filmy and acrimonious, causing at times a sense of constriction exceedingly troublesome. The saliva is always altered in its quality and quantity; the mouth, after a disturbed sleep, being dry, furred and offensive, followed perhaps, in a few hours, by a discharge of a fluid of a very acrid nature. The mucous is frothy and tenacious, being ejected by considerable effort, and of a very sour and unpleasant taste. Indeed it would appear that this dreadful complaint locates its worst and most enduring consequences upon the teeth, from the fact that these organs are attacked at once, and continues its destructive influences long after it has ceased to exist in the stomach, from whence it originates. If of long duration, it will produce decay in teeth of the hardest and best formed structure, in spite of all the care that is generally bestowed upon the health and cleanliness of the mouth. Although it is often paroxysmal in its attacks, having intervals of apparently entire ease, yet, from its very origin to long after its perception by the patient, its effects can be traced by the peculiar condition of the mouth, by an experienced individual.

The gums will present at times a cadaverous appearance, becoming almost white, and upon being pressed will be found soft, and for an instant a deep red color will pervade the spot that has been pressed, the paleness returning at once. At times a deep blush can be noticed in the depressed portions, as if the gums were formed in stratas, and the second layer was inflamed, which was observed through the first by means of its thinness at these points. As the diseases increases its effects in the mucous membrane of the mouth, the apices of the gums

between the teeth will become slightly inflamed, and present the appearance of brick dust, as is described by some in treating of phthisis pulmonalis; and further observation will, we opine, establish this symptom as one belonging peculiarly to dyspepsia, for it can always be seen in individuals where the disease is of long standing. The pain and regurgitations so constantly occurring after eating, are occasioned to a great extent by the food being taken into the stomach mixed with the diseased secretions of the mouth, which have become unfit to assist the gastric fluid in forming the chyme; instead of which there is found a mixture of various juices, with partly decomposed viands taken by a perverted appetite, which continue the almost ceaseless round of irritating influences, preventing every curative process of the economy.

Again, the morbid influence produced in the mouth by dyspepsia, is not effected alone by the direct action of the sour, bitter, acrid, oily and offensive matter thrown into it from the stomach, not only by the immediate communication of inflammation through the mucous membrane, but by the nervous irritability produced in the whole system. The derangement of almost all the sensations, the transitory but severe pains all over the body, in fact, the alteration of all physical and mental sensibilities evidence such a condition, and show how fully the nervous connection is sustained and effected, and also lends a positive proof of the disturbed state of all the secreting organs; these being regulated most powerfully by nervous influences. The mouth, therefore, and its many glandular appendages, must partake largely in the common disturbance, to the alteration of the fluids thereby produced, which cannot occur without injurious effects to the teeth. The nutrition of the whole system being equally at fault; the poisoned chyme must produce defective chyle, and this must again poison the blood, which becomes an irritant of the worst kind, as it pervades every fibre of the body, giving nourishment and secreting the various fluids of the glands, which are dependent upon its constituents for their chemical character.

In health this is found to present all that is required, and so

abundantly as to give to these parts perhaps a greater recuperative power than is found in any other part of the body, so that we find ulceration of the mucous membrane lining the buccal pharyngeal parts capable of a very rapid regeneration, whilst this power is quite limited in the enteric and urinary. From these few facts, it is evident that a diseased condition of the blood originating in dyspepsia, must act as a morbid agent in the diseases of the gums, teeth, &c., it being the derivative source of all the fluids of the mouth, whether they come from the parotids, sublingual, submaxillary, or submucous glands; being diseased, the unavoidable conclusion is that they act as morbific agents upon the teeth and mouth generally.

Duodenitis and dysentery, in their effects upon the mouth, will be treated under the head of enteritis, as its name implies inflammation of the intestines; it perhaps will be better understood as one involving the mucous membrane lining the jejunum, ileum and colon, although the upper portions are generally considered most liable to inflammation, from their peculiar shape, position and structural arrangement, confining the fluids or other causes of irritation in this portion.

From what has been said of the power of communicating disease through the mucous membrane, it will be readily conceived that the diseases of the stomach often descend by this means to the part at present considered, and from the causes just enumerated, result in a secondary local affection of the jejunum, ileum, cœcum or colon. But as the object of this paper is to show that general disease, more particularly alimentary, affects the health of the mouth and ultimates in disease of the teeth, the causes producing the original disturbance in distant parts will necessarily be omitted, other than they may be found at times acting as morbific agents to both. Mr. Good, in his invaluable treatise on the practice of medicine, says, "that the sympathy of the mucous membrane of the intestines is extremely acute, and its sensibility very great." This is fully illustrated by the system at large suffering so extremely when it is inflamed; at such time the appetite fails, and an oppressive languor ensues, attended by general uneasiness; fever alternates with chilliness,

the pulse varying accordingly; the skin is sometimes dry and again clammy; the tongue frequently moist, but as often dry and constantly furred. In fact, all the attending symptoms and consequences are so nearly allied to those of gastritis and dyspepsia, that we must refer to the matter written under these headings for further particulars, merely noticing that in fatal cases of enteritis, the lining membrane of the mouth generally ulcerates, and not unfrequently large portions of these surfaces slough away. The tongue becomes swollen, red, and finally assumes an aphthous condition, is covered by pustules resembling drops of candle wax. French authors give them the name of wax drops, in treating of this sign in *aphtha*, as a specific disease of the mucous membrane—of which we shall speak as we progress further in this subject. The fact that the mouth, in even a fatal termination of enteritis, becomes the seat of so dreadful a condition, is of itself sufficient to establish the tendency, in milder forms, to serious irritation in this cavity.

Indeed cases are recorded wherein the mucous membrane has been found, upon dissection, to have its entire surface—that is, its whole extent in the body, highly inflamed, even to an ulcerous condition of many parts, as before mentioned.

We are reminded at once, by referring to the fact that dental irritation is more frequent in the summer months, of the almost direct relationship existing between the stomach, lower intestines, mouth and teeth. Even a careless observer must have witnessed that as soon as fruit becomes a large portion of the diet of individuals, that the mouth assumes, almost simultaneously with the stomach and intestines, an irritated and inflamed condition; which condition resolves itself into gastritis or dysentery, without preventive means are adopted—leaving in its stead an irritable condition of the organs of secretion, especially the liver.

The treatment is not comprised in our province. We may state, however, that all food should partake of a mucilaginous character, of a nature to soothe the inflamed surfaces, and that when mercurial treatment is deemed expedient, its action must be carried until a strong impression upon the gums is

made—and so sustained for a considerable time; showing again how closely connected with the health of the mouth and teeth is this class of disease—for its cure is often dependent upon the amount of absolute change produced in those secretions that are directly or indirectly connected with and dependent upon the condition of the mucous membrane.

(To be continued.)

ARTICLE II.

*On the Intrinsic Calcification of the Permanent Tooth Pulp, as constantly associated with Dental Caries.** By S. JAMES A. SALTER, M. B., F. L. S., &c.

MY object in this communication is to give an account of a peculiar morbid condition which occurs in the tooth pulp of carious teeth, affecting the pulp after it has arrived at its adult form, and its functions, in the development of primary dentine, have ceased.

This pathological change may be defined as the impregnation of the various tissues of the tooth-pulp with calcareous matter —their calcification, in fact occurring in multitudes of isolated points, and by the multiplication and enlargement of these islands of calcification, involving more and more of the structures of the pulp, and its ultimate conversion, under certain favorable circumstances, into that peculiar form of secondary dentine called *osteodentine.* The occurrence, to some extent, of islands of calcification in the pulps of carious teeth is (as far as my

*The author of this highly interesting paper, having furnished us with a printed copy, we take pleasure in placing it before our readers—omitting, however, the last plate.—Eds.

observations go) as universal as it is unknown.* The complete issue of this process in the evolution of osteodentine is by no means common, and only occurs under certain favorable circumstances, when the process of calcification may continue for a long period, uninterrupted by the laying bare of the pulp cavity.

It will be necessary, before entering upon the details of this subject, to make a few remarks upon the changes which occur in the production of normal dentine, and the manner in which the pulp is reduced to its adult condition, as well as the anatomy of the latter organ ; and this will be necessary both as a basis for the explanation of the pathological changes, and also to show the analogies, and at the same time the differences,

* Mr. Tomes was probably acquainted with the *results* of this process when in an advanced stage ; but he appears to have confounded the structure produced (osteodentine) with dentine of repair, as well as being wholly unacquainted with the intimate nature of the changes that occur. He remarks, "We see instances of this event of irritation in cases where the pulp is *converted* into dentine opposite a point from which a portion of enamel and of the dentine of the crown, has been removed by wear, by fracture, by the file, or even by caries." (Dental Physiology and Surgery, p. 254.) Mr. Tomes is here evidently speaking of dentine of repair, as may be seen by the figures in his own work, and to which he refers (figs. 32, 84 and 98) as well as by my figures in the Guy's Hospital Reports (On Dentine of Repair, &c., Guy's Hospital Reports, vol. viii, part ii.) *Now here the pulp is not "converted" into dentine.* It is produced simply, as in normal dentine, by the out-growths of the superficial cells, and has no analogy to the change I am describing. Again, Mr. Tomes says, "Indeed, if the pulp of a tooth extracted for caries and subsequent odontalgia be carefully examined, there will, with few exceptions, be found more or less calcification near the point towards which the disease had advanced." (loc. cit.) He probably here speaks of calcification of the puip in an advanced stage, this is very palpable to the unaided senses. The pulp, however, *does not* calcify soonest near the decayed part : on the contrary, the pulp is soonest effected by intrinsic calcification near the extremity of the fang, and the limitary clear layer on the surface is the *last* to calcify. That Mr. Tomes was unacquainted with the early condition of intrinsic pulp calcification, as well as the nature of that process, is sufficiently obvious from the following observations : "By irritability, here, is meant an increased susceptibility to pain, and to morbid action, *unattended with organic change.*" "The most frequent cause of irritability is caries immediately prior to its laying open the cavity." (loc. cit.) Now it was from just such a tooth that the pulp was taken from which fig. 5 was drawn, exhibiting most clearly the "organic change" I am describing.

between the normal process and the pathological changes which I here endeavor to elucidate.

The formative tooth-pulp is a papilla, consisting of numerous blood-vessels and nerves, distributed through multitudes of cells and nuclei, and an immature connective tissue, and covered in by a basement membrane—the whole constituting a form precisely similar to the dentine of the crown of the future tooth.—A series of columnar cells, very similar in appearance to those of columnar epithelium, is found arranged in an even layer upon the surface, covered in only by the basement membrane; from the distal extremities of these cells appear outgrowths, in the form of capillary tubes, and continuous with the cell-wall, and these increase in length by the backward recession of the body of the cells, the tubes being thus prolonged inwards; these constitute the animal basis of the dentinal tubes. The intertubular tissue appears to be formed of a hyaline animal structure, in which no histological elements are indicated.*

It must be recollected that this process is entirely superficial, that it occurs from without inwards; that no other histological elements enter into the formation of the dentine besides the cells described; and that the nerves and blood-vessels recede as the dentine advances. The "*conversion*" theory, which involved the idea of a complete change of the entire pulp-structures into *normal* dentine, is now known to be altogether erroneous; and this it is especially important to remember in relation to the present subject.

The mode in which the animal material is impregnated with the calcareous in primary dentine is very remarkable, and has a certain similarity to the morbid condition I am about to describe. It has been shown by Czermak†, and confirmed and still further elucidated by myself‡, that after the animal mate-

* Kolliker, Handbuch, der Gewebelehre des Menchen, 1852. Also Lent, Ueber die Entwicklung des Zahnbeins und des Schmelzes, in Siebold and Kolliker's Zeitschrift fur Wissenschatliche Zoologie, 1854.

† Czermak, Beitrage zur mkroskopischen Anatomie der menschilichen Zahne, in Siebold and Kolliker's Zeitschrift, 1850.

‡ On certain appearances occurring in dentine dependent on its mode of calcification, in Journal of Microscopical Science, vol. i.

rial of dentine has sketched out its anatomical form, it becomes calcified, not by an even gradual impregnation throughout the whole, nor in any relation to the course of its structure, but in isolated globular patches, by the enlargement and fusion of which the whole is formed into an even coherent mass. And I would further remark—what is of value and interest in reference to the present matter—that the animal material is palpably altered at the time of calcification in physical and chemical characters: it is harder, denser, and contains less water in proportion to the animal solid matter.

I have already alluded to osteodentine as the issue under certain circumstances of the morbid change now under consideration, and I would here observe that osteodentine constitutes one of those peculiar forms of dentine called "secondary," on account of their being after-formations—developed, that is, after the primary system of dentine has been matured. I must add, that the other two forms of secondary dentine, "dentine of repair" (formed by laminæ on the inner surface of the pulp-cavity, as repair and recompense for external wear, decay, or fracture) and "dentine-excrescence" (a nodular growth of dentine arising spontaneously on the interior of the pulp-cavity, and without disease or apparent cause)—that these forms are in all essential particulars the same as primary dentine, formed and calcified in the same way, having contour lines parallel to the surface, and not involving blood-vessels or nerves. The re-

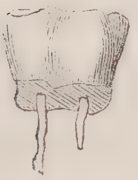
Fig. 1.

Fig. 1.—Diagramatic section of canine tooth, showing the relative position of the three forms of secondary dentine. The tinted parts in the pulp-cavity represents the secondary tissue: the "dentine of repair," fills the summit of the pulp-cavity, and corresponds to the worn exterior surface, the vertical lines on either side indicating the direction of the tubes which limit the external lesion and the internal repair. The "dentine excrescence" is situate on the posterior surface of the pulp-cavity in the fang. The forming "osteodentine" occupies the axis of the pulp.

lation of these three forms* to one another have thought it well to illustrate in a diagramatic outline, fig. 1, representing them in an early stage, and before they have become confused together. The tinted mass at the top of the pulp-cavity represents the dentine of repair, in proportion to the wear at the top of the cusp, and the lines passing from the surface to the margin of this repair-tissue are the dentinal tubes, limiting the external injury and the internal recompense; in the axis of the pulp, the tinted line indicates the forming osteodentine; and the nodule on the side of the pulp-cavity is dentine-excrescence, in a frequent situation, and of a usual form. Though osteodentine is distinct from the other forms of secondary dentine, it is, nevertheless, frequently associated with them, especially with dentine of repair; and the union of the one with the other is the ultimate event of the secondary formations, where they reach entire completion; but this union is the very latest part of the change, and the soft external layer on the surface of the pulp, which separates the forming osteodentine on the one side from the primary dentine and the dentine of repair on the other, is the last to calcify.

My attention was first directed to the peculiar morbid change I am describing by noticing the physical alteration the pulp had undergone in association with caries. Upon opening the pulp cavity of a carious tooth, I had noticed that the pulp was firmer and more coherent than in a natural state; that it did not collapse and readily dry up, but retained its form, and was frequently elastic when bent. It has occasionally happened that in extracting a carious tooth it has broken across at the neck, and the crown has come away, leaving the fangs in the jaw, the pulps of the fangs slipping out of their canals and remaining stiffly bristling from the broken surface of the crown. Such a specimen is represented at fig. 2. It was accidentally obtained in extracting a molar tooth, when, from some malformation of the fangs, probably embracing a mass of bone, the tooth broke across, and the pulps of the fangs came away with the crown,

Fig. 2.



*The different varieties of secondary dentine will be found more particularly discussed in a paper of my own, in the Guy's Hospital Reports, already alluded to, where I believe they were first systematically arranged.

leaving the fangs still embedded in the jaw. In this instance, the pulps were of the firmness, and possessed the elasticity, of whalebone, and much reminded me of that substance. When the calcification is absolutely complete as in the specimen figured in fig. 3,* the whole is perfectly hard and brittle. In every stage of calcification, excepting the very last, the axis of the pulp is the hardest and the exterior more or less soft and pulpy.

Fig. 3.

Until the complete solidification of the pulp, it may readily be torn up with points of needles, uniformly in a longitudinal direction.

The color is also modified by the change, but this depends on the degree of calcification that has taken place. If examined in an early stage, before much earthy matter has been deposited, the pulp is usually found very red, and in a state of obvious hyperæmia, but as the change proceeds, the white calcific deposit reduces the color, and the pulp becomes opaque, and nearly white; and if the change reaches so far as to form osteodentine, then it is of semi-transparent yellow, owing to the obliteration of almost all intervals in the structure, and the formation of a nearly homogeneous mass, containing very few channels or interspaces.

To ascertain the meaning of the changes that have taken place, it is necessary to examine the pulps of teeth (taken from those variously decayed) under the microscope, especially with the aid of chemical reagents. And I may here remark, that in examining a very large number of the pulps of carious teeth, decayed in all degrees, and in every variety of place, I have not once failed to discover, in some degree, the condition I am describing; that is, since I have been acquainted with its optical appearances. If a pulp affected to no very great degree by this

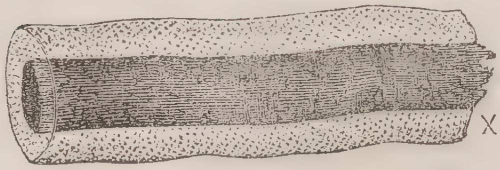
Fig. 2.—Crown of molar tooth; the semi-calcified pulps remaining attached.

Fig. 2.—Molar tooth with pulp wholly calcified, but still unattached to the primary dentine. The crown of the tooth is removed, that of the calcified pulp remaining. Enlarged about two diameters.

* For the loan of the specimen from which this figure is taken, I am indebted to my friend, Mr. Samuel Cartwright, jun.

intrinsic calcification be viewed by transmitted light, and a magnifying power of fifteen or twenty diameters, it is found preternaturally opaque, especially in the centre: where the calcification is deeper in degree, the opacity is greater, and the limit between the clear edge and the opaque axis more obvious. In fig. 4, is represented one of the pulps taken from the tooth shown at fig. 1, magnified eighteen diameters. The clear margin is unusually broad, and the calcified axis is very marked and exactly defined; the margin of the calcified axis is very opaque and black, while along its absolute centre there is a certain amount of luminosity. In all degrees of calcification, excepting the final change, the outer layer of the pulp is seen to be transparent.

Fig. 4.



In attempting to view the entire pulp with higher powers—say forty diameters,—its opacity is found so great that little can be made out without previously rendering it clearer by the application of chemical reagents. For this purpose, I have usually employed acetic acid and solution of caustic alkali, but principally the latter. Acetic acid renders the whole very clear, but develops the nuclei and blood-vessels, especially the former, to a degree that causes some confusion, and, by its action on the earthy deposit, produces an evolution of carbonic acid gas, though this occurs to a degree much less than would be imagined. Caustic alkali, however, has no objections; it renders the whole brilliantly clear, exhibiting the calcific deposits, and the nerves,—the latter with great beauty and brilliancy.

In fig. 5, is represented a portion of a tooth-pulp, from the fang of a slightly carious molar tooth, treated with solution of caustic potass, and magnified forty diameters. It exhibits very well the appearances characteristic of the calcific change in an early condition. Running along the pulp are seen very numerous nerves, in bundles of various sizes, with clear intervals

Fig. 4.—One of the pulps from the specimen represented at fig. 2, exhibiting the calcified axis, and uncalcified surface. Magnified 18 diameters.

between them; and scattered throughout the whole promiscuously, excepting for a small space at each margin, are multitudes of small bodies, for the most part of a lenticular form, with very decided and dark boundary outline, lightening off to

FIG. 5.

a brilliant centre; the long axis of each, being uniformly the same as that of the pulp. These are the "calcification islands."*

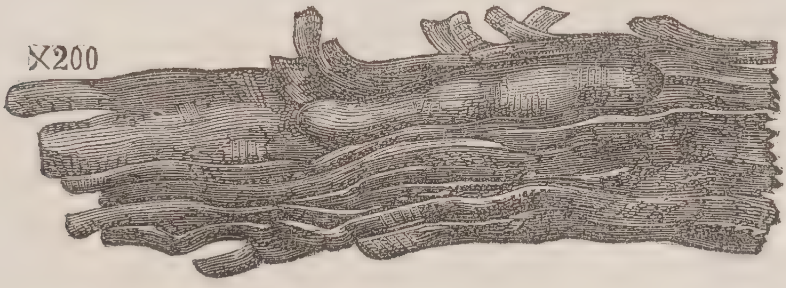
The appearance of these bodies is very peculiar, not only from their form, but from their extreme darkness of outline—reminding one strongly of oil-globules or bubbles of air in fluid—and arising as in them, from the very different refracting power of the object and the material in which it is placed. So much do these bodies resemble bubbles of air (as seen by low powers,) that at first I concluded they were such, and that their peculiar form was caused by the direction of the tissues in which they were found. But this was a mistake. Upon examining pulps in which a very deep impregnation of calcareous matter has occurred with the same reagent, one finds traces of the original

Fig. 2.—Pulp from the fang of a slightly carious molar tooth, treated with caustic alkali, exhibiting the outer surface uncalcified, and numerous calcification islands in and among the nerves in its axis. Magnified 40 diameters.

* I have thought it well to call these "calcification *islands*" in contradistinction to the other form, "calcification *globules*" (their analogues,) met with in primary, and the other two forms of secondary dentine.

structure more and more obliterated, and the whole field of view is seen to be full of the calcification islands more or less fused together, giving an opaque blackish or clouded appearance, in which little can be made out beyond a general longitudinal direction. The extreme of this condition is represented at fig. 6,

Fig. 6.



taken from the fang of a very highly calcified pulp. Here all residue of previous tissue was lost, and the mass consisted of adherent calcification islands, in which, the adhesion was closest in the longitudinal serial direction, giving a coarse fibrous aspect.

It must be observed that the outer surface of the pulp is never the seat of this process, excepting just at last, when the secondary dentine becomes confounded with the primary; one always sees the outer limit clear and transparent, as long, that is, as the pulp can be readily detached from the cavity. The distribution of these calcified islands through the pulp is liable to some variety, but I have usually found them most abundant in those portions near the extremity of the fang, and in the mass occupying the large chamber in the crown of molar-teeth; and it is in these regions that we most frequently find the calcification advanced to its complete issue in the production of osteodentine, and that more especially in the former. In the neck and summit of the cusps this change occurs late; I have one specimen in which the cusps are altogether soft and unchanged, while the central mass is in a state of complete calcification.

I will now proceed to the more precise consideration of these

Fig. 6.—Calcification islands, in the last stage, previous to complete fusion, united longitudinally, but laterally separable. Magnified 200 diameters.

calcification islands, in reference to their *form* and *structure*, their *chemical* and *physical characters*, and their *relation to the tissues among which they are found.*

I have already spoken of these bodies as being lenticular in form, and this is by a great deal their most frequent shape; they are most frequently lenticular or elliptical, occasionally a true oval, and very rarely round. A form which is not unusual is represented at fig. 7 *a;* it is evidently composed of a linear series of islands partially fused together, the lines of union being still distinct, and the whole constituting a long ellipse. Occasionally one finds true cylinders, even throughout, tolerably straight, and with truncated extremities. Sometimes they are found in linear series, but not fused together, as seen in fig. 7 *b*. A very frequent form may be described as club-shaped cylinders, with rounded and very slightly bulbous extremities. They always show a great tendency towards a longitudinal series, and they fuse more firmly end to end than laterally (fig. 6.) The size of the islands varies almost indefinitely, from the smallest perceptible microscopic object to others the $\frac{1}{50}$th of an inch in length; the size, moreover, seems very little to affect, if at all to alter, the forms of the islands, for the same shapes may be recognised, and in about the same proportion, in the smallest as in the largest. When viewed with low power, the outlines of the islands seem tolerably even, but when examined with higher powers, the outline is frequently found irregular, from the fact, that as a rule, all, except the most minute, are composed of numerous smaller ones, more or less fused and adherent together. This compound character is not always seen even in some of tolerable magnitude, but in the largest it is most marked; in these, one sees clearly the outlines of the smaller islands, not only at the edge, but deep in their substance, and by altering the focus, lines of partial and imperfect union are

Fig. 7.

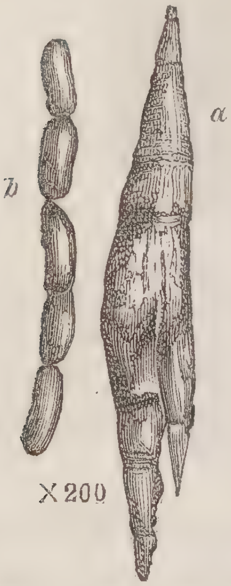


Fig. 7.—Occasional forms of calcification islands. Magnified 200 diameters.

developed, very like those seen in primary dentine, where the globules have imperfectly fused. When perfectly fused, the outlines are lost, and the whole, retaining the original form of the pulp, becomes hard and semi-transparent, as in the specimen represented at fig. 3. I have already remarked that this calcification, up to a certain extent, causes a peculiar stiff elasticity of the entire pulp, and it is remarkable that this physical character, general through the whole pulp, should be produced by the distribution of isolated particles of a very different physical nature. The calcified islands are individually perfectly hard and unyielding, and break with brittleness when subjected to much pressure.

Chemically, these ossified masses consist of an animal basis and earthy salt, soluble in muriatic acid, and are probably analogous to ordinary dentine in this respect. When treated with acetic acid they are not much acted upon, but yield only a portion of their salts with the evolution of gas, which appears in the form of air-bubbles among the fluid of the specimen. When treated with hydrochloric acid the action is far more energetic, the whole of the earthy matter appears to dissolve out, leaving a peculiar cartilage-like residue of much firmness, and retaining the exact form of the original island, neither more nor less, it is clearish, and altogether destitute of the dark, highly-refracted outline visible in the object previous to decalcification. I have never succeeded in making out, either in the original or the decalcified islands, any laminæ, tubes, or other histological forms; but this would necessarily arise from the peculiar optical dificulties that exist; a small, isolated, very dense mass among tissues of great tenuity would scarcely yield indications of its own structure.

The relation of these islands of calcification to the tissues in which they are found is the most remarkable feature in this subject, and is likely to be of no small physiological value in reference to the whole subject of calcification of soft structures. I have already enforced the fact that the calcification (by globules) of primary dentine and the other two forms of secondary dentine takes place in a soft tissue formed from particular

cells, and normally adapted and intended as the recipients of such impregnation; but in the structure we are now considering, the case is far otherwise; here we have an organ, the tooth-pulp consisting, besides cells and nuclei, of connective tissue, blood-vessels, and multitudes of nerves, and we find the whole of these structures swallowed up and obliterated by the calcification process. I have just stated that by the removal of the earthy matter with hydrochloric acid a form of animal matter identical with the previous calcification island is left, and this is the case with the smallest as well as the largest: *the addition of the earthy matter is in noway interstitial.*

The best power to examine these bodies in relation to the other tissues is that magnifying 200 diameters; and for this purpose the application of caustic alkali is a very necessary preliminary step.

It is found almost impossible to isolate the calcification islands from the tissues in which they are found; and their intimate relation with the nerves is very remarkable, and easily de-

Fig. 8

Fig. 9.

Fig. 8.—Calcification islands in the body of a compound nerve; the nerve-fibres in no way displaced or bulged out by their presence. Magnified 200 diameters.

Fig. 9.—Calcification island (produced apparently by the fusion in linear series of three smaller ones) in a compound nerve, from the pulp of a carious tooth; a single nerve-fibre being, as it seemed, involved in the calcareous particle.* Magnified 200 diameters.

* The author regrets that this figure has not been accurately rendered by the artist; the calcification island is on a plane too superficial, and the course of the central nerve-fibre into it is not so clear as in the original.

monstrated, from the fortuitous circumstance that the reagent necessary to clarify the object renders the nerve structures only more distinctly visible.

The islands of calcification are very numerous among the nerves, and are seen on the edge of bundles of nerves, and in all parts of the axes. The nerve-fibres do not seem in any way pushed aside by their presence, for we see them of considerable size in the axis of a compound nerve without any bulging of its surface or edges (fig. 8). The relation of the individual nerve-fibres it is not so easy to demonstrate; still (though I am not disposed to commit myself to the unqualified statement,) I believe I have frequently seen a single fibre pass into the very axis of the calcification island on one side and leave it on the other, being lost and obliterated for that space in its course. Such a specimen I have figured (fig. 9,) and the only source of fallacy one can imagine might arise from the nerve passing below the calcification island on a different plane, and so be covered up by it; but this I do not believe. What is more unmistakeable, and convinces me that the nerves do really sustain the calcific impregnation, is what is seen in the advanced stages of that change. One very frequently sees a considerable bundle of nerves, entering, so to speak, a dense semi-fused mass of calcification islands and leaving them further on in their course, the nerves having the ordinary and normal structure up to and in contact with the calcified mass, which obviously holds exactly the position previously held by the intermediate portion of the compound nerve. What has become of the compound nerve for that interval, unless impregnated and obliterated by the calcification process? I can conceive no other explanation of these appearances than by imagining that the change pervades the tissues promiscuously and without elective choice. I do not consider that the inability to demonstrate nerves in the decalcified mass in any way militates against this doctrine; the calcification process is not merely an addition of earthy salts to the animal mass; the latter is altered at the same time.*

*Kölliker, while speaking of the evidences to be obtained from the examination of decalcified bone, remarks, "that everything which thus presents itself,

Frequently, though the calcification be far advanced, a single nerve-fibre can be traced for a considerable distance; the same with small bundles, but never, as far as I have seen, with large.

The cells and nuclei, which are seen pretty numerous in the substance of the adult pulp among its vessels and nerves, undoubtedly share in the general change, and probably the former produce the few dentinal tubes that are found in osteodentine.

Of the change produced in the blood-vessels I cannot speak with much accuracy, but they seem to share, to a certain extent, in the general change. If we examine a section of perfectly formed osteodentine (pl. i, fig. 2), the few blood-vessels in the axes of the dentine haversian systems are seen certainly much less numerous than those in the original pulp, and even some of these, as I shall presently show (pl. i, fig 3), become obliterated by calcification. I have, however, frequently seen them, of quite healthy structure, when almost every trace of the other tissues has been lost. Upon treating a tooth pulp with rather dilute acetic acid, I have followed the vessels among the calcified masses for a considerable distance, their coats exhibiting the characteristic nuclei with unmistakeable clearness, and quite unaltered. It seems that the blood-vessels, the larger ones at least, undergo the calcific change at a late period.

We trace the process of calcification readily enough up to a certain point—where the islands are still separable and not wholly fused together: we readily pick abroad small fragments, and examine them as moist specimens: it would be physically impossible to make sections for dry mounting, and we require, moreover, some clarifying reagents to make the specimen intelligible. When, however, the calcification is absolutely complete, we find a firm coherent mass, capable of being reduced to sections as thin as normal dentine, and displaying appearances which are recognized as osteodentine.

in an isolated form, is not necessarily a morphological unity." The converse of this may be said with equal truth—that because a hystological element, which is supposed to enter into the animal basis of a calcified mass, cannot be isolated from the same decalcified, it does not prove the original non-existence of that tissue.

It is not my intention to give any detailed description of the anatomy of osteodentine, as it is so generally understood and described in works of anatomy, &c. There are, however, some points in its structure which have never been noticed, and which are of interest, not only for themselves, but as throwing light upon, and being explained by the changes I have been describing.

Osteodentine may exist in any number of systems, and the amount of pulps involved does not appear to affect the maturity at which a partial calcification may arrive. In fig. 1, pl. i, is represented a section made near the apex of the fang of a carious bicuspid tooth, containing one, and only one, perfectly formed dentine system, the rest of the pulp not being affected.*

Osteodentine has fewer tubes than any other form of dentine, and is consequently very transparent: this transparency does not altogether arise (as does that of dentine of repair) from the filling up of the tubes with secondary deposit within them; many of the tubes are doubtless so filled up, as is the case with all dentine formed in states of tooth irritation or inflammation, but they are nevertheless really less abundant, and that is the true cause of the peculiar transparency. This circumstance is quite intelligible upon the idea that all the tissues of the pulp share alike in the common change: in this case doubtless the calcified nerves and blood-vessels and connective tissue would not develop tubes, but only those elements of the pulp which are similar to the cells on the surface of the pulp, constituting the "membrana eboris."

Osteodentine is described as consisting of systems of dentine around isolated blood-vessels; and so it generally is, but occasionally, and not very infrequently, indeed, the central canal can no longer be seen; it is obliterated by the calcification of the blood-vessel, and its position occupied by an indefinite clear structure. Here the last of the soft tissues of the pulp is swallowed up by the calcific change. (Plate i, fig. 3.)

Again, a tissue resembling dentine is not the only result of

* For this specimen, I am indebted to the kindness of my friend, Mr. Walter Jones, of Worcester.

this process. Under certain peculiar circumstances, I have found the pulp converted into crusta petrosa: the peculiar circumstances which appear to be connected with this change being a preternaturally abundant communication between the pulp and the periosteum—the communication being large and short, so that the pulp and the periosteum are almost continuous. I have* elsewhere exhibited specimens illustrative of this circumstance, without, on that occasion, drawing any general inferences from them. In these instances, by means of erratic vascular canals, the communication between the pulp and the periosteum was very direct and abundant, and in each there was a development of bone in the cavity. A still more remarkable example of this condition I found in a carious temporary molar tooth, which had been retained in the mouth till eighteen years of age. In this instance, the fangs had been somewhat absorbed, especially on the inner surfaces, so as to lay open the pulp cavities to near the main chamber of the tooth, and moreover the canals were considerably enlarged; by this means the pulp and the periosteum were almost as one. Upon making a section of this tooth across the crown at the line indicated in the figure of it, the pulp was found converted into a mass of crusta petrosa and dentine confounded together: there were many vascular canals among it, but these were mostly ground out in the process of making the specimen: they appeared to communicate with the principal one which is still visible. The laminæ were numerous, and of the character of those found in ordinary cement; the dentinal tubes were tolerably, though not very abundant, and the two tissues were entirely confounded together. There were also numerous interspaces among the tissue, the result of the imperfect fusion of the calcification islands.

These observations on the calcification of the tooth pulp, and the particular relation of the calcific change to the tissues of that organ, are not without value in a practical sense, mutually

* "On Erratic Vascular Canals in Teeth, associated with the Development of Bone in the Pulp-cavity." ("Trans. Path. Soc.," vol. v.)

explaining, and being confirmed by certain circumstances which arise in operations on the teeth.

There are two operations connected with the teeth, in one of which constantly, and in the other frequently, we have to do with the pulp cavity, and are influenced in our proceedings by the condition of the pulp itself. These are respectively *tooth-pivoting* and *stopping* or *plugging*.

In tooth-pivoting, a gold or other pin is introduced into the pulp-cavity of single fanged front upper teeth, with the crown of an artificial tooth attached to it, after the crown of the natural one has been cut off for unsightly caries. But before adapting the artificial tooth it is necessary to prepare the pulp-cavity by means of a drill for the reception of the pin. In this process we have to do with the pulp in every varied stage of calcification, and the vital phenomena which it exhibits are exactly in accordance with the degree of change. Where the calcification is slight, the pulp is exquisitely sensitive, and the application of the drill produces intense pain; and in this condition it bleeds. As the calcification advances, the sensibility and the tendency to bleed gradually and regularly subside, till at length in the completely formed osteodentine these indications of vitality have ceased altogether, and the calcified pulp may be drilled with as little inconvenience as attends the cutting of a hair or nail. Sometimes, however, one finds, even in an advanced stage of calcification, an intensely sensitive spot in the pulp, and sometimes the point of the drill will be stained with blood in piercing it; but this is easily explained, by imagining that in the one case a nerve-fibre, and in the other a blood-vessel has escaped the common change. Still it must be stated, as a rule, that *the sensibility and the bleeding are inversely as the calcification.*

In plugging teeth it is necessary to cut away all the softened and carious dentine, and we not unfrequently reach the calcified pulps, when all the phenomena I have just described similarly display themselves.

The calcification process I have now been describing must

certainly be considered as a morbid change,* though in effect a reparative one; it occurs in disease and as its result, but when complete, obviates the ill effects which would ensue. It thus falls under the category of those many processes, which although essentially morbid, are the means of averting a condition which would be fatal to the individual organ affected. This process finds its counterpart in those many conditions in which irritation and increased vascularity, the result of disease in contiguous structures, issue in the deposition of adventitious matter: in this instance the adventitious matter is determined by the normal nutritional affinities of the organ. It furnishes, moreover, an interesting example of a qualitative disturbance of nutrition resulting from a vascular disturbance which would seem to be merely quantitative.

* I cannot think that this change in a diseased condition in man is quite analogous to what we find in some of the lower animals in which osteodentine is normally formed. In them it uniformly commences at the upper extremity of the pulp-cavity, and is adherent to the primary dentine. One can easily conceive that the pulp, in these cases, breaks up into compound papillæ, that on the *surface* of these the dentine is formed, while the nerves and vessels recede before it.

PLATE I.

Fig. 1. Transverse section of a bicuspid tooth, near the apex of the fang, with a single system of osteodentine, and a large patent pulp cavity. (Magnified 28 diameters.)

Fig. 2. Section of fang of carious tooth: the pulp-cavity completely filled with osteodentine. (Magnified 40 diameters.)

Fig. 3. A single system of osteodentine, in which the central vascular canal is obliterated by calcification. (Magnified 200 diameters.)

FIG. 1. X 28.

FIG. 2. X 40.

FIG. 3. X 400.

ARTICLE III.

A few Thoughts on Professional Qualifications, for Dental Tyros.

We have no fear of unintentionally offending the youth of our profession by the use of the word in our caption, as they can at once refer to various lexicographers and ascertain that tyro means one not yet master of his art. The explanation may not be altogether unwise, as we know of high dudgeon having been taken by a few gawky students, who were charitably termed "*novices*" and "*new travelers*" on the road to professional excellence, when lo! and behold, they became restive and turbulent, from the force of habit, we presume, as nothing could appease their outraged dignity—but a truce to trifles, let us turn to grave points.

Young men generally enter our profession with but two prevailing ideas; the first money making, the second, an easy luxurious occupation. True, many feel that their position is greatly advanced, and no doubt is, by having themselves nominally enrolled as a member of a profession which lays claim to high rank and noble attainment, and they consequently look upon any change in this particular as a happy hit, if the public but yield in any degree to their claims.

Again, some engage in the pursuit without such craft, but entertaining a mere respect for a calling which they imagine easily acquired, easily fulfilled and entirely divested of the labor of mechanical trades; feeling confident that it will most of all gloriously enrich, they turn to it, without those mental acquirements demanded by law and medicine—without the capital needed in commercial and mercantile pursuits, looking upon dentistry as an occupation freed from these difficulties, giving ease, profit and renown to all its members, however variously possessed of ability. But most strange to say, this impression exists up to

actual experience, when they discover the unimagined intricacies of practice and the immense advantage of a liberal education. The power and effect which cultivated tastes and personal elegance command, the polish of manner and high breeding required, the patient forbearance necessary in the intercourse with erratic character, nervous irritability and misguided conduct so often met with in the numerously attended office—the enduring energy demanded in mastering the personal peculiarities on the one hand, and the physical obstacles on the other; the unceasing industry necessary to perfect any chemical or mechanical process—the indispensable absence of all discouragement—the years consumed in combating unknown difficulties and the constant application of the mind necessary to comprehend the laws presiding over the different processes in dental mechanism and the secrets of animal economy.

The intense labor, fatigue and unavoidable discomfiture at times operate with fearful impression and make the stoutest heart tremble, and yet, oh! glorious confidence, we find the plough deserted for this life-absorbing pursuit, and the hammer and chisel lying unused for the luxury of dental practice. The broken down artizan embraces this profession to heal the wounds his pride has suffered and to fill his empty pockets, and that too in the most incredibly short time. After a few months passed in pouring over ponderous books, bound in calf skin, and filled with Greek and Hebrew, they come forth fully prepared for the combat, and ready to confront the oldest and best of the profession. Some, because they can push a needle through a camel's eye, feel themselves peculiarly drawn to the profession and capable of fulfilling its entire want, forgetful or ignorant of the fact that it is necessary to swallow a few such monsters before becoming a dentist.

One gentleman founded his claim of suitability upon the fact, of having, whilst duck shooting, forced a number two shot into a carious tooth, which preserving it, secured to the profession a great man, although he may be somewhat doubtful as to the grammatical composition of a simple sentence; yet he says he can "fill a tooth as well as any man and insert whole sets of artificial ones."

A certain barber declares he was born a good dentist, from his having two teeth at birth, and always has pulled teeth because it came natural to him, and made him money without trouble. This list we could increase ad infinitum, but as they are anything but pleasant reminiscences, we will proceed by reminding the uninitiated of the importance of fully comprehending the labor that is necessary in acquiring a competent knowledge which will enable him to strike at the highest excellence; the keeping of this secret, in the mind's eye, will enable one to appreciate the vast amount of study which dental practice involves. The whole field of medicine becomes a leading study, so as to determine what effects are likely to be produced in the mouth, not only as a sequallæ of the various diseases, but as a consequence of the kinds of treatment employed, and the peculiar effect, whether local or general, of remedies administered; for we scarcely know of a disease or its treatment, that, under some form or circumstance, does not involve the mouth or connecting relationship. This knowledge may not generally be found indispensable, but the want of such knowledge frequently occurs and its possession offers supreme advantage, not only in the skillful treatment of such cases, but in the estimation given to its possessor by the public, tending to increase and enlarge his sphere of usefulness and his pecuniary emolument.

Then, again, dental mechanics, in all its bearings, involve the application of chemistry, to enable the artist to make the several ingredients he employs, to purify his composition, to reduce his various materials to convertible forms, in order to supply his wants, to make improvements upon, or to add to those processes already adopted, to analyse substances and to illiminate therefrom useful and obnoxious particles of matter.

Metallurgy and its vast field of useful facts in the combination of metals, and the study of their as yet undefined law of union, their varying degrees of liquefaction alone and in combination, their density, oxydation, galvanic action, gravity, durability, ductility, maleability, &c., offers almost an unexplored region, demanding the highest capacity and energy in the study of it, and, here let me say, a lifetime could be spent and still leave

something for successors to learn in the working of metals, in connection with the dental art.

Mechanical dentistry has derived the greatest advantage during a few years by its incorporation with the art of porcelain manufacture, as through it the most beautiful and artistic results have been produced, rendering a knowledge of this process indispensable, so as to compete with the possessor of this superiority, as well as to improve upon present perfections. Here let me insist upon the necessity of a thorough knowledge of this most intricate and difficult art, whose vicissitudes and almost unaccountable changes, render its highest present perfection a somewhat unsatisfactory and most disheartening study, still leaving for future science and labor the amplification of this branch of dentistry. Even as it is at present perfected, it requires a great amount of experience and labor, presenting anything but the promise of ease.

It is somewhat curious to observe the astonishment of both patient and pupil when first witnessing the necessary physical labor bestowed in filling a delicate tooth, even of the smallest size. Their ideas of the practice generally resemble a midnight view of flowers or the common interpretation of genius, whose labors are considered the result of heaven bestowed favors, not of human powers and toil-worn applications.

It is not surprising then that dental ligaments are occasionally found whose existence confers the secret of pain in tooth drawing, or that young operators frequently discover some system about to revolutionize dental practice, when, alas, a short time proves their scheme to be an abandoned one of some departed progenitor of the science.

Our art can, in no degree, be conferred by the laying on of hands, of the most gifted; the peculiar ability to operate comes not thus; no combination of mechanism has as yet been found able to suit the varying forms of mechanical dentures; no learned lectures on temperament and physiognomy have as yet been able to make the dental student understand the restoration of natural expression, or to lay down laws whose general application will result in the re-establishment of comparative

youth, comfort and beauty, and yet with pride and gratitude do we frequently see such results being conferred on patients by the labor and industry of men of talent and long experience in our profession.

Such superiority is reached only through the toil of the wisely applied industry of years, and cannot be imparted by oral instruction, but is delved out in fatigue and by unwavering energy, and exists only with the possessor of these giant qualities.

We have no wish to discourage untried ability or deserving aspirants, being ever ready to help all such with our humble means, but we do denounce the encouragement of men, who, because they can *whittle a piece of wood* to any shape, feel themselves capable of dental practice—because they feel mortification in following a lowly, yet honorable occupation, suitable to them by nature and physique, should seek dentistry from an unmanly shame of the calling of their fathers, without those qualifications arising from a thorough education, seeking the enlargement of the scientific and the useful.

It is by such hybrid characters that the profession is pressed down, that the mass is degraded, and the calling a doubtful cognomen among strangers. It is these individuals who decry a branch of the profession, and attribute to it a deteriorating influence, forgetting that this very department has achieved, through the labor and toil of skillful men, a perfection that is attained in no other science or art. Eminently honorable because useful; most artistic, because it restores to nature its lost beauty; elevating, because in reaching its perfection, it embraces in its study all the influences acting upon the mind and heart developed in the countenance, whose entire restoration is in its domain and whose fundamental law is harmony. True, they do not perceive these facts, but are they any the more wanting. Surgery amputates a limb, but does not restore one. Operative dentistry prevents disease from going further but does not recover the lost form of appearance of the tooth; medicine sometimes through analogy prevents death, a point yielded only through courtesy, as positive proof must be forever wanting to establish the fact. The supply of almost all human wants is

only in a measure complete, still to be improved and added to, but mechanical dentistry in the hands of honorable skill reaches a perfection beyond all. In the first place, the usefulness of some artificial teeth is as complete as the natural organs, so perfectly adapted as often to dispel from the mind of the patient, in many cases, the consciousness of their presence, so completely harmonizing with the complexion, so conformable in shape to the countenance, as to leave no point of detection, no discrepancy. The lines and rotundity almost of youth are restored, the mouth regaining its wonted expression. Its function recovered to the great advantage of the whole economy of the body, replete with beauty and usefulness.

Little men, and *sometimes* those fortunate in worldly possessions, decry this branch to the preference of the other, the first, because their conceptions of its requirements through ignorance, are absolutely at fault, being incapacitated to embrace the knowledge and means necessary to be acquired to strike at perfection, they fail repeatedly, and denounce their own errors and incapabilty in abusing a branch of the profession entirely out of their reach. The second decline its practice, because it involves labor and toil much greater than in the operation of filling teeth, because the responsibilities are incomparably greater, because the consequences of the two departments are entirely different. In the one there is a never ceasing requirement of perfection, not only from the patient, but from the community in which they reside, with a certainty of exposure and condemnation if a fault be committed, or in the result of failure. In the other, there is an analogy between its practice and the errors of an unfortunate physician who buries all his prescriptions with his patients. A good or bad filling is covered by years of entire concealment and absolute forgetfulness, and this occurs in almost all cases. The community of friends of the patient are absolutely excluded from all possible means of judging of the merits or demerits of the case, except as the grace of manner of the operator has impressed the patient, this being of necessity the only topic upon which either can decide. The one has to do with one material only and that prepared by

others, whose use involves time, ranging from thirty minutes to three hours, when the fee is received and the matter forgotten by all, at least for years. The other involves the employment of the arts and sciences, in the moulding of the most numerous and intricate substances into intelligent shapes and suitable compounds, whose manipulation requires weeks and months of labor. The great trouble is found in the intense difficulties to be encountered on the one hand and the comparative simplicity on the other. In the magnitude of the responsibility, and publicity in one, the unavoidable obscurity and inobservant character of the other. The manipulations so delicate, are still made in pungent, blackening chemicals, earths, metals, gums, &c., of the laboratory, the toil and burning heat of which though resolutely endured are not, in their nature, always successful. Those of the operating room are performed without contact with materials, whose use there is any room to doubt or to discover or prepare, their easy labors are performed over a beaten course, whose result is the same one day as another, and whose pecuniary success depends in a great measure on personal accomplishment.

We do not wish to detract from the skill and dexterity required in operating, or intend to give the idea that little is required in this department, for there is abundant proof of its imperfect accomplishment in the fact, that, perhaps, half the operations performed are entire failures, the remaining half being protected by doubt and simplicity.

But there is a great difference, seemingly overlooked by the profession, to the disadvantage of mechanical dentistry. In the operative department there are peculiar difficulties of course, but these for the most part are overcome by skill and manual dexterity, whilst the other demands all of these and more, for it has not only to vanquish the obstacles to the most exact manipulations, but it has to do with laws and actions so subtile as to defy, in many cases, the longest experience, the most acute knowledge of chemistry, for defeat comes unexpectedly near the completion of a process, by the casual introduction of some unseen, yet potent agent, whose discovery is only to be

made through the aid of science and enduring toil. "Every theory which urges man to labor and research, which excites acuteness and sustains perseverance, is a gain to science; for it is labor and research which lead to discoveries." So says the greatest man of modern science, and with whom every man of sense will agree, and by this law mechanical dentistry will ever hold a high position with capable and honorable men, for its perfection can only be reached through labor and research, and the application of enduring perseverance with the most intense acuteness.

ARTICLE IV.

Metallic Dies. By Professor P. H. Austen.

*(Continued from July No., 1855.)

The table on page 367 is designed to present in one view the relative value of certain metals and metallic alloys, in respect of the three properties—fusibility, hardness, contractility. In expressing the composition of the alloys the initials of the English names are used, not as in chemical works, of the Latin names. This is done because to the majority of readers, the initials A. L. T. will more instantly suggest the names, antimony, lead, tin, than the corresponding Latin initials, Sb. Pb. Sn.

The scale of fusibility is prepared in part from reliable sources, and in part from direct experiment. The scale is expressed in round numbers. In the case of lead, one authority gives 594°, another 612°; 600° is nearly the mean between the two. In the case of zinc, 773° is the fusing point according to Daniell, and 1996° that of copper. In the first

* Erratum.—In July No., 1855, page 372, 24th line, for "variety and consequently costliness," read scarcity and consequent costliness. This conclusion of our article having been greatly altered from the original report, is worded in terms more suited to the readers of the Journal.

place, it is very doubtful whether these high temperatures can be ascertained exactly to a degree; in the second place, the design of this table does not require such exactness.

The scale of hardness has been carefully prepared in the manner described on page 373*. A hammer of 7 lbs. weight, falling from a height of nine inches upon a steel punch 1-6th inch in diameter, indented the several samples of metals, $\frac{1}{4}$ inch thick, placed on a heavy anvil. The depth of the indentation is expressed in thousandths of an inch, and is in each case the average of from 6 to 12 trials. For example, in nine samples of zinc, the punch sank to the depths respectively 17, 20, 17, 17, 18, 18, 20, 18, 18, a difference so slight as to confirm rather than invalidate the accuracy of the experiments.

The micrometer screw used in these experiments was made by Mr. John Jones of this city, and works with most beautiful accuracy. The screw has 40 threads (square cut) to the inch, and carries on its head an index which moves over a circle graduated into 25 parts. These divisions, being about $\frac{1}{4}$ of an inch apart, are easily read, and register each, 1000th part of an inch. The readers of the Journal will obtain a correct idea of these minute divisions of an inch from the following statement. Each leaf of the Journal is 5-1000th of an inch thick; 10 leaves, (20 pages,) 5-100ths; the thinnest letter paper, about the 1-1000th. The shrinkage of an average sized zinc die from outside to outside of the alveolar ridge, measuring two inches, will be 27-1000ths, being on each side a space nearly equal to the thickness of three Journal leaves. From inside to inside of the lower jaw, we have about the same average. In the first case, the plate would "bind," and if the ridge were covered by an unyielding mucous membrane, it would prevent accuracy of adaptation. In the second case, the plate would have too much lateral "play," and consequently lack stability. Again, in a moderately deep arch, say a half inch in depth, the shrinkage between the level of the

* The references in this number are to the July No., 1855.

ridge and the floor of the palate will be nearly 7-1000th—rather more than one leaf of the Journal. In the deepest arches this shrinkage becomes a serious difficulty; in the shallower cases, it is not of much moment, as there is no mouth so hard as not to yield the 1 or 2-1000ths of an inch.

It is scarcely necessary to remark, that the softer the metal the higher its number in this scale. In the columns of contractility and fusibility, the lower numbers represent those metals which are most fusible and have least shrinkage. The metals and alloys enumerated have a very different value in the three scales; of course the intrinsic value of any one must be determined by the relative importance of these three properties, in consideration of the purpose to which it is to be applied.

The scale of hardness has been prepared with much care, because it is the first, to the writer's knowledge, ever attempted. We find, as intimated on page 373, in most works on metals, a "Scale of Hardness," but this indicates not resistance of the metal under a blow, but merely the comparative ease with which it may be scratched. In this scale, the six metals stand in the following order: copper, bismuth, cadmium, tin, antimony, zinc, lead; an order that does not indicate correctly their relative value to the dentist.

Cadmium, antimony and bismuth do not appear in the table. The first, because of its scarcity and costliness, and the two last, because of their extreme brittleness, are not adapted to practical use. Antimony and bismuth both rank lower in the scale of hardness than zinc, but they were too brittle to stand the blow of the hammer, and no indentation could be obtained by measurement of which they could be compared with any accuracy. Lead is in reality softer than its number 138 would indicate. Experiments with an ingot ½ inch thick, place it as high as 144, being exactly 8 times softer than zinc. This is the only case in which the increased thickness of the ingot affected the result.

The scale of contractility is expressed in decimal fractions of an inch, and indicates the amount of contraction, per linear inch, that takes place in each metal between its point of fusion and a temperature of 74°. The scale is made by careful measurements of ingots 3 inches long, $\frac{5}{8}$ inch wide and $\frac{1}{4}$ inch thick, poured into a soap-stone ingot mould. The ingot mould of soap-stone has the two fold advantage of retaining its heat, so as not to allow the metal to chill too suddenly, and of not itself expanding by heat. A metallic ingot mould would, by its own expansion, either destroy the accuracy of the experiments, or at least would greatly complicate the process. The writer proposes in the repetition and extension of these experiments, to use plumbago instead of soap-stone, as being possibly more entirely free from any expansion. The scale here given may, however, be relied upon as sufficiently accurate to guide in the choice of metals.

In Ure's Dictionary, and elsewhere, may be found tables giving the linear expansion of metals between 32° and 212° Assuming the ratio of expansion to be uniform up to the melting point, it is easy to find the total expansion (or contraction) of each metal. We should thus have the total contraction for zinc, .01162; for lead, .00858; for tin, .00495. The results by calculation are, in all three cases, a little less than those deduced from experiment—a discrepancy arising from the fact established by Lavoisier and Laplace, that solids as well as liquids expand in an increasing, not in a uniform, ratio.

From the various tables alluded to, we find the average contraction of the 10 following metals and alloys, between the boiling and the freezing points of water, to be for

Platinum	.00091	Gun metal	.00182
Antimony	.00108	Brass	.00191
Cast iron	.00111	Tin	.00236
Bismuth	.00139	Lead	.00285
Copper	.00180	Zinc	.00298

An examination of this table, and comparison with the following one, give us some interesting facts.

On page 380, (July, 1855,) a very common error with respect to the effect of antimony in type metal was noticed. We here see, not that antimony expands under decrease of heat, but that its rate of contraction is to that of lead nearly as 1 to 3, and that, when added to lead in the proportion of 1 to 5, it diminishes the total shrinkage nearly one half. Antimony, iron, bismuth and zinc may all, in the moment of passing from the liquid to the solid form, by virtue of their crystalline tendency, slightly expand, and so fill the fine lines of a delicate matrix; but once solid, they obey the universal law, and contract under decrease of temperature.

Again we see verified the statement made on page 375. The actual shrinkage of a metal is dependent not only upon its ratio of contraction, but also upon its point of fusion. Tin, with a rate of contractility more than twice that of iron, has not half the actual shrinkage. Zinc contracts more rapidly than copper or brass; yet, starting from a lower temperature, its total shrinkage is much less.

	Melting Point.	Contractility.	Hardness.	Brittleness.
1 Copper	2000°	.02236	.020	1
2 Brass 2 C—1 Z	1870°	.02216	.024	2
3 Zinc	770°	.01366	.018	5
4 1292 Z—579 tin	660°	.01233	.024	4
5 Lead	600°	.01066	.138	1
6 5 type metal 5 L—1 A	500°	.00633	.045	10
7 Tin	440°	.00633	.054	1
8 2 L—1 T	440°	.00633	.050	3
9 1 L—2 T	340°	.00500	.040	3
10 2 L—3 T—1 A	420°	.00433	.026	7
11 5 L—6 T—1 A	320°	.00566	.035	6
12 5 L—6 T—1 A—3 B	300°	.00266	.030	9
13 1 L—1 T—1 B	250°	.00066	.042	7
14 1 L—1 T—1 B	250°	.00066	.035	6
15 5 L—3 T—8 B	200°	.00200	.045	8
16 2 L—1 T—3 B	200°	.00133	.048	7

The last column contains an approximate estimate of the relative brittleness of the 16 samples given. As in the other columns, the low numbers represent the metals, so far as this property is concerned, most desirable. Those marked below 5 are malleable metals; those above 5 are brittle;

zinc, marked 5, separates these two classes and belongs to one or the other, according to the way in which it is managed. Melted and poured into a shallow mould, it may be broken. Even in the more compact form of a well shaped die it is possible by undue violence to crack it; an accident the liability to which is necessarily increased, when the die is made too shallow or too flaring. Meeting with some such vexatious accident, one might well ask, taking in hand a piece of sheet zinc and bending it in any direction, if these two can be one and the same metal. The only difference is that sheet zinc is annealed zinc. By annealing zinc, we take it out of the class of brittle metals, and fit it for the malpractice of the most unskillful operator; not meaning to say that the most skillful may not at times gladly avail himself of the change. In the manufacture of sheet zinc it is rolled at a temperature between 212° and 300°, retaining its malleability when cold. This change from the brittle to the malleable state takes place at about 230°; continues unchanged up to 300°. After this it becomes less malleable, and at 450°, or the melting point of tin, it becomes again brittle. The simplest way to anneal a zinc die is to place it in the melting ladle with about a table-spoonful of water, removing it in 30 seconds after the water has boiled away. If the fire is a very hot one, remove it immediately on the disappearance of the water. It will often happen that the die is annealed in the process of taking the counter-die. This will more certainly occur when *Nos. 7, 8 or 9 are used for the counter. For example, take tin: using a mass twice the size of the die, should it be heated to 540°, (100° above melting point,) it would not, allowing for loss of heat by radiation and contact with the cast iron ring, (if one be used,) heat the zinc beyond 330°. Lead, cast as cool as it could possibly be poured, unless in a very heavy ring (such as a "cart wheel box") or in quantity too small for a well shaped counter, would be apt to raise

* When metals are named thus by numbers, reference is had to the table on page 367.

the zinc at least to 400°, and so impair its malleability, whilst, if poured as hot as many are in the habit of doing, the zinc will remain as brittle as when first cast.

The other brittle metals and alloys may be rendered somewhat less brittle by immersion in boiling water, except the two last. In the course of the experiments necessary to the preparation of this report, a number of alloys, valuable in respect of fusibility, contractility and hardness, were found useless because brittle. Further experiment may enable us to assign to some of these the requisite toughness. Meanwhile it is hoped that the table here given may induce others to prosecute inquiries for themselves.

The design of this report being rather to offer practical suggestions than to indulge in theoretical refinements, I have taken the metals as they are found in commerce. The copper of commerce almost always contains traces of arsenic, nickel and tin, which impair its malleability. Commercial zinc always contains iron, lead, copper, cadmium. Block tin generally contains antimony, copper or lead. Lead is usually nearly pure. Of course these impurities affect more or less the properties of the metals; but practically they may be disregarded except when, as in No. 4, we wish to make an alloy of very exact proportions. This is a mixture of 40 atoms of zinc to 10 of tin, and is the only instance in the table of an attempt to unite two metals in their atomic proportions. Theoretically such mixtures are the most perfect; but practically there is a two-fold difficulty; first, a want of absolute purity of the metals which necessarily destroys the accuracy of the proportions; secondly, the impossibility of calculating with absolute certainty the loss by oxydation of the more fusible component of the alloy. Hence, in the composition of the brasses, bronzes and pewters it is usual to make such additions of the separate metals to a lot of old alloy, as the judgment and experience of the founder may dictate, due allowance being made for the burning out of the more fusible metal.

The slight commercial impurities of copper, zinc, lead

and tin may, in the making of metallic dies, be safely disregarded by the dentist. A much more important point is the necessity of using clean melting ladles, and of having more than one. Take in illustration a very common case. Zinc is melted in a ladle containing the remnant of a previous melting of lead. The lead, so much the heavier, remains at the bottom of the ladle, and, if *all* the metal in the ladle be poured, sinks to the bottom of the mould. The die is taken from the sand when the zinc has set, and the more fusible lead runs out, leaving the die imperfect on its face: or if allowed to cool entirely, it will, while apparently perfect, have a part of its alveolar ridge composed of lead; consequently too soft to swage the plate. This accident may be avoided in either of three ways: use separate ladles; or avoid pouring all the metal, which leaves the heavier lead in the ladle; or use tin for the counter-die. In the last case the zinc readily alloys with any remnant of tin, having very nearly the same specific gravity, and the only result, from repeated meltings, will be a softening of the zinc in proportion to the tin added.

In the use of the more fusible alloys of the table, from type metal down, a copper ladle and spirit lamp will suffice for their fusion. In fact, flame heat will be better than an anthracite or charcoal fire, from the less liability of overheating. Excess of heat wastes the more oxydizable metal and alters the proportion of the alloy; and where a copper ladle is used, a coal fire will very quickly raise the metal to a temperature, at which it will alloy itself with the copper, destroying the ladle and letting the metal quietly down into the fire. There is a tinned iron (hammered, not sheet-iron) ladle of French manufacture, very convenient in size, very durable, and not liable to this last accident attending the careless use of copper. In using either the tinned iron or copper, the ladle should after each melting be instantly scraped with a spatula or wiped out with paper or shavings: otherwise the proportions of the alloys, where several kinds are used, will become changed.

Most of our readers may prefer to draw their own inferences from the table given, and select such metals or alloys as may best suit their particular views, convenience or custom. And the scope of this article would be greatly mistaken if we should be understood as wishing otherwise, or as dictating to any one a method or material suitable for all cases. A few suggestions, however, may not be amiss. Our concluding observations upon the properties of metals will be more conveniently made by taking them seriatim, as given in the table, interposing some brief notice of metals and alloys not found there.

Iron.—Fuses at 2786°, sp. gravity 7.78. Cast iron ranks as a brittle metal, but in the solid form of a die would resist any necessary force. Having a surface hardness almost equal to steel, it would admirably suit the dentist, but for two serious objections, its high fusion point and its consequent great contractility: we might also add its roughness of surface, which in so hard a metal would indent the plate. As a component of alloys, it is used in small quantity to harden copper, and most probably the zinc of commerce may owe a slight increase of hardness to the trace of iron it contains.

Nickel.—Never used in the arts in its pure state. Less fusible than iron, it diminishes the fusibility of the alloys of which it is a component. It is chiefly used in the manufacture of German silver, albata, the *white silver* of the Chinese, &c., all of which are too infusible, contractile and costly to be used for metallic dies. We have made no attempt to alloy it with the more fusible metals.

Copper, Brass, Bronze.—The two first are shown in the table to be inferior to zinc in hardness, decidedly inferior in fusibility, and much more contractile. Zinc, superior in all except its brittleness, when made tough by annealing, is therefore unquestionably preferable to either. For the purpose now under consideration we should entirely exclude from the laboratory, copper, or any of its various alloys with zinc, forming brass, Bath metal, sheathing

metal, pinchbeck or mosaic gold. The hardness of zinc will be increased slightly by the addition of 30 or 50 per cent. of copper, but it increases also the shrinkage, and makes it harder to melt.

The alloys of copper with tin, forming bronze, gun metal, bell metal, speculum metal, &c., have the advantage over those with zinc of being very much harder. They are all, however, more brittle, and are all as objectionable on the score of infusibility and shrinkage. To those wishing to make trial of bronze we would recommend alloys of 6, 8, 9, 10 and 12 copper to 1 tin. The first is most brittle, the last is softest. In melting, care must be taken to prevent the waste of the tin, which readily takes place at the high temperature of melted copper. The purest "grain" tin and Swedish copper should be used in making bronze. 2 tin and 1 copper, form what is called "temper," and may, perhaps, be advantageously employed in hardening tin, using 1 part temper to 100 parts tin. The formulæ given in the table for hardening tin are, we think, better, because more readily fused.

The alloys of copper and tin, if not very useful to the dentist, are interesting as illustrative of the remarkable results that so often, in the alloying of metals, defy all attempts at *a priori* reasoning. There are some general rules that may measurably guide in originating or in modifying alloys—the physical properties of the components, entering, as it were, into mutual compromise. Thus we expect to find the alloy of 2 brittle metals itself brittle—so it always is. A brittle metal, if in equal parts, will usually render a tough one brittle: if either be in excess, the result will vary accordingly—the brittle metal, however, having always the more influence.

Alloys of two ductile metals defy all calculation as to their probable properties. Copper is highly ductile, and tin is very malleable; while speculum metal (2 C—1 T) is the most brittle of all alloys. Gum metal (9 C—1 T) is tough and rigid, neither malleable nor ductile: by adding tin,

the *softer* of the two metals, the alloy is actually hardened, until, in the proportion of speculum metal, it cannot be cut with steel tools. Again, 6 C—1 T will not stand a heavy blow, yet its cohesive strength is twice as great as either component: and 1 bismuth, 4 tin has a cohesive strength 5 times greater than bismuth and 3 times greater than tin. In the case of ductile metals, where mixed in nearly equal parts, about half the alloys will be ductile, and half will be brittle; where either metal greatly predominates, the alloy is usually ductile: but the ductility of an alloy is seldom, if ever, equal to that of the more ductile constituents.

The influence of alloying upon fusibility is also remarkable. The alloy is invariably more fusible than the most refractory component, and often than the less refractory, provided the latter does not exist in too small quantity. Silver solder is a familiar illustration; copper less fusible than silver, makes the silver itself more fusible. So, again, the soft solders, except where the lead is in excess, are more easily melted than tin. But only actual experiment could have revealed the remarkable fact that certain alloys of lead, tin and bismuth, fusing respectively at 600°—440° 500°, will melt in boiling water.

Zinc.—This metal in its simple unalloyed state well deserves the important place it holds in the laboratory of the dentist, who moulds in sand. Metals or alloys harder than zinc are more infusible and liable to greater shrinkage: whilst those which are more fusible and contract less, gain these advantages at the expense of hardness. In the first class we have gun-metal, or bell-metal, and alloys of zinc with small proportions of iron, antimony and copper. In the second class may be instanced alloy No. 4 of the table, in which case we see that the hardness of the alloy is diminished in a greater ratio than its shrinkage, making it, by consequence, less valuable, the difference in the melting point of the two not being sufficient to give any practical advantage.

We have alluded elsewhere to the amount of shrinkage of zinc and the manner in which it prevents accuracy of adaptation. Summing up briefly, in the worst possible case—a very deep arch and the entire mucous surface *very* hard—*first*, the plate will bind on the outside and so not fit the ridge: but supposing it to fit down upon the alveolar border, it will *secondly* fail to touch the abrupt sides of the deep arch, and *thirdly* it will, by a still wider interval, fail to come in contact with the roof of the mouth. Many use zinc in such cases, burnishing or hammering the plate down upon the plaster cast; thus injuring the cast and only partially correcting the difficulty. Others resort to the practice of bending the edges of the plate. To those who adopt this expedient (without which we fear dental mechanical practice with many would soon to be at an end) we would suggest the propriety of dispensing with the air-chamber, so universally (and often so unnecessarily) used; inasmuch as by this method of bending down the edges of a plate touching in no other portion of its palatine surface they secure the largest kind of an air cavity.

A better practice than either of the above named is to complete the swaging upon a fusible metal (Nos. 11 to 16) die, with the same counter-die used for the zinc, placing pieces of paper or sheet lead upon the counter where the plate fails to fit the new die. By this means we avail ourselves of the hardness of zinc and the non-contractility of the fusible alloy. In the writer's judgment this is the best plan in all cases where zinc alone will not give a secure adaptation. It may be well here to caution the operator who is inexperienced in the use of fusible alloys. When poured into a sand matrix, they retain their fluidity much longer than zinc, and are very liable to be spoiled by the upward escape of the vapor of the sand. The sand mould should be thoroughly dried, and then allowed to cool. This practice of drying the mould is safest in every case, whether with zinc or fusible metal. If the haste of the operator will not permit this, it may be well for him to know that

by dampening the sand with *soapy water he will materially lessen the risk of "blowing." Why soap should exercise any such influence we must leave to others, or to another opportunity, to inquire.

Lead.—In its pure state is useful only as a counter-die; for which purpose it is improved by the addition of antimony, forming various grades of type metal; or of tin forming soft solder, or pewter. The composition of type metal varies in different foundries, and is usually kept secret. There is often a small per centage of copper and tin and sometimes of bismuth; but the chief ingredient is antimony, varying from $\frac{1}{4}$ to $\frac{1}{8}$. The former is used for the smallest types, is hard and very brittle; the latter is used for the largest types. An alloy of medium sized type and lead, equal parts, forms an excellent material for the counter to a zinc die: so also is alloy No. 8, and either is cheaper than tin alone.

Tin.—In its pure state, more suitable for the counter than for the die, though used for this latter purpose by many who practice the "dipping" method. To such we would recommend, for the counter die into which the cast is to be dipped, lead 9, antimony 1, or lead 4, tin 1; or pure tin, and for the die, alloy No. 9, or some of the more fusible alloys, Nos. 11 to 16. In this selection, it is to be remembered that the metal for the die must be the harder and at the same time the more fusible, whilst both should shrink as little as possible. It is commonly thought that the shrinkage of the counter compensates that of the die, and makes the latter a fac simile of the plaster cast. A few moments' reflection, with the aid of a simple sectional diagram, will convince any one of this error, bearing in mind that all shrinkage is to be measured towards the centre of the mass.

* For this hint we are indebted to Dr. R. T. Reynolds, of Philadelphia; and recently we had brought to our notice an instance in which a locomotive was stopped from inability to generate steam because one of the men had washed his hands with soap in the water used in the boiler. The boiler had to be entirely emptied and re-filled before a head of steam could be raised.

Those practicing this method of obtaining dies, cannot be too strongly impressed with the importance of keeping the two kinds of metal as distinct as possible, and so marked that they will not be mistaken each for the other. The greater care is necessary when the alloys resemble each other. It would be a vexatious mistake to dip the cast in No. 9 and pour No. 8 upon it; quite as annoying this, as to have lead in the zinc ladle; or, where die and counter are made of the same metal, to pour the latter too hot. The first accident requires for its avoidance systematic order in the laboratory, while ordinary care will prevent the two latter. The slovenly or confirmedly careless operator had better avoid having a variety of metals or alloys, as his frequent mistakes will more than balance any advantage to be derived from their use.

We shall conclude this article, which has already exceeded its intended limit, by a few brief remarks upon the more fusible alloys of the table. Bismuth is an essential component of all such alloys, and seems to have greatest effect upon their fusibility, although itself more infusible than tin. For all ordinary purposes, No. 13 will answer. No. 14 differs only in having been repeatedly used, thereby being more thoroughly mixed. It becomes closer grained, is harder and less brittle. Where a still more fusible metal is desired, the proportion of bismuth should double. In Nos. 15 and 16, the weight of bismuth is equal to that of the tin and lead together. So in Rose's fusible metal, (L. 1, T. 1, B. 2,) and an alloy 3 L., 2 T., 5 B., said to fuse at 199°.

The difference in these four last named is in the varying relative proportions of lead and tin. They fuse at nearly the same temperature, but vary in their degree of brittleness. Further experiment is required to determine which of all possible combinations of these three metals is best. If bismuth is in larger proportion, the alloy will be too brittle. The same will happen if the tin exceeds the lead The alloys No. 15, 16, will, we think, be found to answer every purpose required of this class.

These metals must be repeatedly melted to insure their thorough intermingling. The union is probably in part chemical and part mechanical. To this partial mechanical mixture is perhaps to be attributed the pasty, mush-like consistence of these alloys in their semi-fused state—the more fusible component melting and holding in suspension the particles of the less fusible ingredients. In this state it may be taken up in a spoon and dashed on to a green plaster cast, which should be cold and unvarnished, and may be surrounded merely with a strip of paper. In a few moments it will be hard enough to keep its shape without the paper, which may then be removed and the sides of the cast trimmed to any required shape. At a temperature of about 150° to 175° it can be cut like cheese. Another method of obtaining the counter die, is by the *clichee* process. Pour the metal into a suitable ring, remove the film of oxyd from the surface with the edge of a card, then when the metal is just on the point of setting, bring the cast down upon it with a quick steady motion. If properly done, the impression will be very sharply defined and free from any air holes; but to do it skillfully requires practice. The counter-die obtained by either process must be allowed to cool in the air, not in water, for, if there is the slightest trace of dampness on the surface, it will spoil the die next to be taken. Adhesion of the die and counter where the same metal is used for both, is prevented by, 1st, coating the counter with whiting, 2d, having it quite cool, 3d, pouring on the metal for the die in a pasty, semi-fluid condition.

Some of our readers may think that on some points we have been unnecessarily plain and diffuse; others may detect errors of statement; and others wish that we had been more specific and explanatory. The first should remember that what is to them an old story may to others be quite new: to the rest we repeat the remark with which we began our essay, that it is not claimed to be either infallible or exhaustive. Our object will have been fully answered if we shall have suggested to some any new and useful idea,

or shall incite others to the further investigation of a subject that we feel convinced will repay a more extended research.

ARTICLE V.

Ambler & Avery's Contributions to the World's Fair.

Our professional brethren will understand, and, we trust, appreciate the motives governing us, in thus presenting to them and the public the peculiarities of our contributions to the World's Fair, which have given rise to so much discussion. We do not purpose at this time to renew this discussion, or even allude to it, except as a fact; our object being the presentation of the peculiarities above alluded to, several of which we claim as decided improvements, admitted to be so, and adopted in the practice of some of the most skillful practitioners in the country, (*scientific, practical men.*)

When the proper officers at Washington issued their circular inviting contributions to the exhibition in London, we concluded to send such specimens of practical cases as would illustrate our various methods of mounting and inserting artificial teeth, and made application for space sufficient for said exhibition, which was granted: and in process of time our specimens were upon the walls of the first Crystal Palace; but as is well known to the profession, dentistry or its appliances received no notice whatever at the hands of the jurors or commissioners. Why was this? is a question often asked, but as yet unanswered. Some have assured us that it was an oversight; others have attributed it to an unwillingness to institute a comparison with the European contributions; another reason has been assigned by those who profess to know something of the pro-

ceedings behind the curtain, viz: the reception of *certain* letters from *certain* individuals on this side of the Atlantic, asserting that the specimens of mechanical dentistry sent from this country were not made by those who sent them. But be the cause what it may, the fact of their receiving an honorable go-by is notorious.

As we had been at great expense and bestowed much labor on these specimens, and feeling that they combined improvements worthy of commendation, we placed them (as well as several others) on exhibition in the New York Crystal Palace for *competition*, and with them the following letter:

The Judges of Dentistry, &c.—*Gentlemen:*—Permit us to call your attention to the following peculiarities of the specimens contributed by us to the Exhibition, illustrative of our methods of inserting artificial teeth.

We present for your examination these specimens, combining, as we believe, several new, important and practical improvements, viz:

1st.—We claim as our own invention a new method of attaching spiral springs to artificial teeth, as shown in the entire set.

2d.—The principle of producing atmospheric pressure (without central cavities) by raising a bead around the edges and across the arch of plates.

3d.—The peculiar method of mounting or setting blocks, (as illustrated in case marked A,) by screws and steady pins. The advantage of this method you will perceive at first sight; one of which is cleanliness, the blocks can be removed and the plate cleaned at pleasure.

We would also call your attention to the other plates, no two of which are precisely alike. The one marked B, is a lower set of peculiar form, for projecting the lower jaw; the one of which this is a duplicate is worn with entire satisfaction.

The one marked C is a new method of giving weight to

the lower teeth, at the same time presenting a gold surface to the mouth.

Cases D, E and F have been worn. D has been worn at intervals by —— (he having another set,) for over three years. E was made for a lady, who wore them (while she lived) with entire satisfaction, and at her death they were returned and received as old gold. F was worn by the wife of ——, who is now dead. The case marked H is a duplicate of one inserted some years since for a gentleman who has lost, not only his teeth, but a portion of the jaw, the cavity extending through and back to the palatine bone. Which loss so affected his speech that it was almost impossible to understand him. The insertion of this plate restored his speech as well as appearance.

You will also see several single teeth lined by melting the gold on them, previously covering the surface of the tooth with platina ribbon and flux. The plate marked G is, as will be seen, inserted on the atmospheric pressure principle, with gum exposed to prevent the diminution of the tasting surface. We have set but few cases in this manner, but they have thus far operated well.

The instruments in the lower part of this case, as you will see, are for beading and banding plates ; also a pair of shear-shaped cutting forceps.

We also present our entire case in competition for *workmanship, and as combining a greater variety of styles or methods of setting artificial teeth, &c.*, than any on exhibition.

We would esteem it a privilege to be present at the examination of the specimens and to point out the peculiarities and explain them more fully than we can on paper.

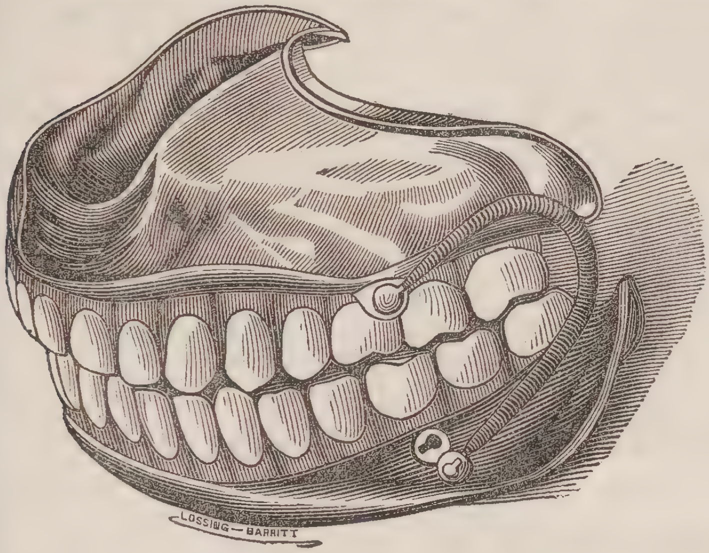
Very respectfully, yours, &c.,

AMBLER & AVERY, 31 Washington Place.

But as your readers have not the specimens before them, I annex cuts to illustrate some of the peculiarities.

The method of attaching spiral springs (referred to) is represented by the engravings A, B and C. The advantages

of this method over the common system of hooking over a bolt are, 1st. You have no projecting bolt to irritate the cheeks. 2d. The springs are less liable to become displaced. 3d. There is no danger of their becoming detached, as that can only be by removing the teeth from the mouth. 4th. The facility for regulating them by stops,



Figs. A—B.

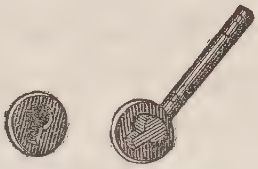
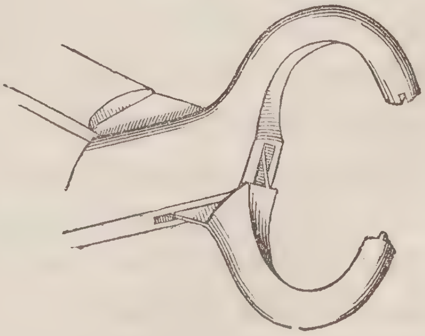


Fig. C.

thereby preventing any irritation or irregularity of action. 5th. The construction is such as to enable the patient to remove or attach them at pleasure, this feature is of more importance than appears at first sight, from the fact that many persons (though successful in the end) find great difficulty at first in wearing full sets of teeth constructed without springs, which difficulty is entirely removed by this method.

Fig. D.



The method of producing atmospheric pressure without central cavities (referred to) is by raising a bead on the inner surface, across the arch and around the edges of the plate, which is done by means of a small machine similar to those used by tin smiths, or a forcep, shaped as in fig. D; the object gained in this method is dispensing with the central cavity, and at the same time securing a vacuum

sufficient to cause the plate to adhere to the mouth. The bead or raised portion of the plate imbeds itself in the gum about the 60th portion of an inch; but as the projection is about one-eighth of an inch from the edge of the plate, no irritation is produced, although the bead settles sufficiently to prevent the air from entering under it. This is found to answer a very good purpose and not liable to the same objections as the central cavity.

The method of setting blocks referred to in the above letter, is as follows: (See fig. E.) Having adjusted the

FIG. F. FIG. E.

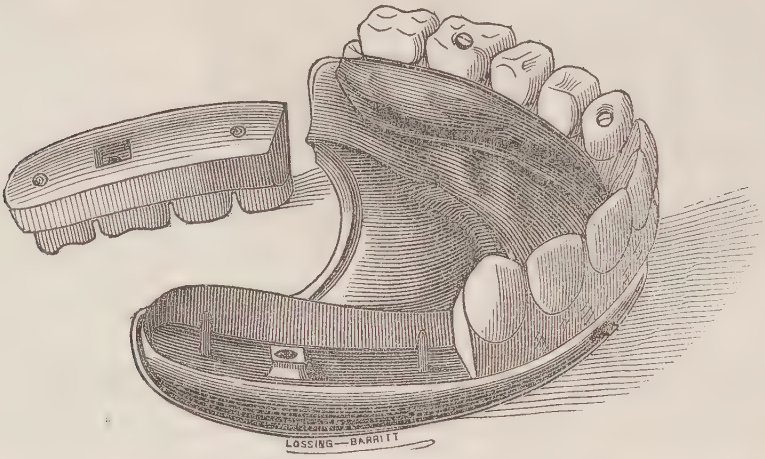


plate to the mouth, turned the outer band and raised the bead (as above described) across the arch, we make four nuts, (two for the front and one for each of the side blocks,) about one-sixteenth of an inch square and the thickness of a ten cent piece; drill a hole in each, then solder fast to the plate. Over these the blocks are moulded with holes through the same, over each nut, and two half through, (see fig. F,) to meet what we term steady pins, which are soldered to the plate so as to fit these holes accurately, then cut the screws and thread in the nuts, making a head similar to an ordinary screw; (the hole being counter-sunken) the masticating surface of the block is entirely out of the reach of wear and hindrance, but so as to be readily removed with a common penknife. After having fitted the blocks neatly to the pins and outer band, we then fit an inner band and solder it to the plate, (the blocks being re-

moved for fear of cracking.) This being done and the blocks secured to their plates, the plate is now ready for finishing up.

The advantages of this method are, *first*, *cleanliness*, (which is by no means a trifling consideration,) as the teeth are easily removed from the plate and replaced by the wearer, they can be kept perfectly clean with but little effort. *Second*, the plate is not as liable to warp or spring in soldering, nor to become bent by wearing. *Thirdly*, in case of accident of any kind, they are more readily repaired; for instance, if the plate has been bent or forced out of shape, by any cause, by removing the blocks it can be refitted to a cast much more accurately than if the teeth were soldered, or should a tooth be broken off, a block can be substituted without fear of cracking the others.

The method of giving weight to the lower teeth referred to, (as fig. C,) accomplishes the object aimed at, but as the amount of labor and material is great, it is of necessity much more expensive than the ordinary method, therefore will not be popular. Your readers, as well as yourself, will doubtless remember the efforts made by several dentists to introduce the use of tin as a basis for lower teeth, contending that a coating of gold was sufficient to screen it from the action of the agents to which it would be subjected; but there are few, if any, who now use it in their practice, it having been fairly tested and found wanting. It was this failure that induced the endeavor to obtain the advantages of tin, at the same time avoiding its disadvantages, and in the plan adopted, the end or object is attained, which is as follows: Instead of coating or gilding the tin, we box it up and compel it to do its work unseen and unknown, except to the maker, (unless he communicates to the wearer, which he is in duty and honor bound to do.)

This substitute for tin is made as follows, (see fig. G.) The plate is got up in the usual way of gold but very thin, about 35, with an outer and inner band of the same thickness, the two as far apart as the plate will admit. These

bands are made sufficiently wide on exterior high enough to cut out return edges to fold around and between the teeth. This being done, and a correct articulating cast obtained, we then line and hard solder the linings to the teeth, and fit as perfectly as possible, (having previously coated the inside of the plate with muriate of zinc,) warm

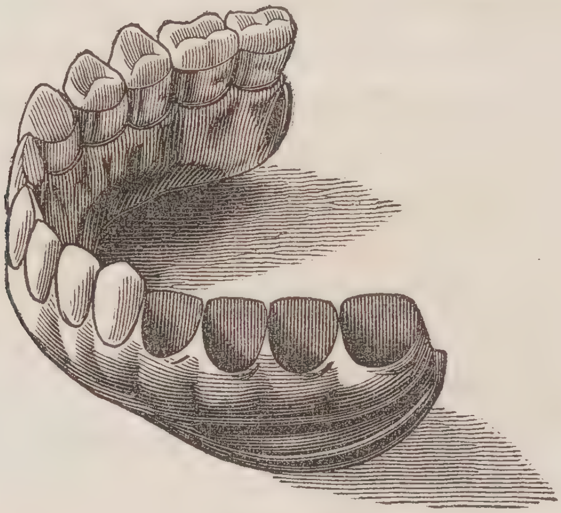


Fig. G.

the lower portion of our cast and pour in with a spoon, shaped for the purpose, melted tin sufficient to fill the space unoccupied by the teeth. After coating, the pointed edges of the band are turned over so as to fill between the teeth, and with a hot instrument soldered to the tin. The plate is then burnished down and coated with wax, except between the teeth. In this condition, it is placed in a gilding solution, and by a galvanic battery a thick coat of gold is deposited between the teeth; so should there be any tin exposed, (which, if the plate is nicely fitted, is scarcely possible,) it is thus coated with gold. The wax is then removed, and the whole well polished and again subjected to the gilding process, which gives a pure gold surface to the whole plate or base.

Fig. G represents ten teeth secured in their places and space or sockets for the other 4, with the edges of the outer band cut out to turn over between the teeth.

The case referred to as letter H needs no description, the artist having given a very good representation of it (see

fig. H.) My principal reason for making a duplicate of this case was in consequence of its being the first instance met with in our practice where the front teeth and that portion of the jaw had been affected by that disease which renders such substitutes necessary. The patient however informed us in all seriousness that this loss was occasioned by a *fever on the Coast of Africa.*

FIG. H.

The cases referred to as letters F and G are illustrated in cuts J and K. The design or object aimed at in this method is to preserve as much of the tasting surface of the mouth as possible; the tongue comes in contact with that portion of the mouth directly inside the six front teeth, more than any other, it is therefore, the most important part

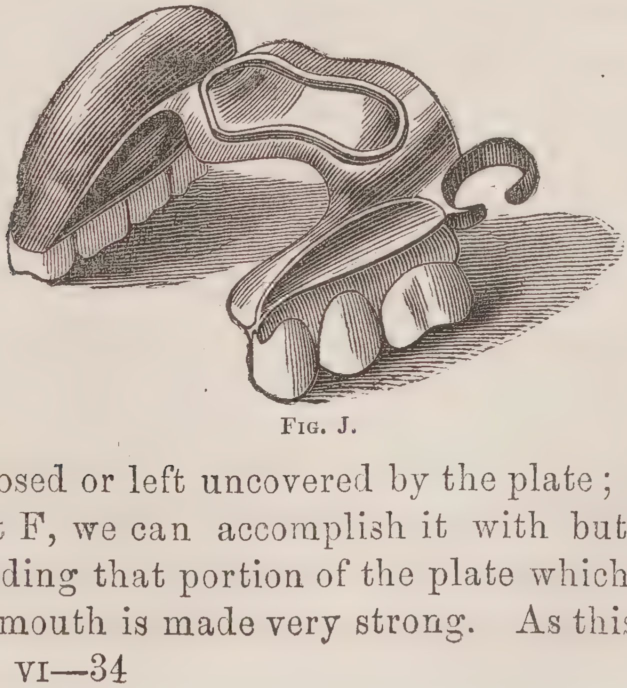


FIG. J.

to have exposed or left uncovered by the plate; in part of a set as in cut F, we can accomplish it with but little difficulty, providing that portion of the plate which crosses the arch of the mouth is made very strong. As this represents

an actual case as before stated we will merely say that the clasp is attached simply to steady the plate, it being retained by the central cavity around the edges of which we soldered a small wire which made the cavity more perfect, and added much towards stiffening that portion of the plate. Entire upper sets (see fig. K) are a little more difficult to adjust; but we have thus far been successful in

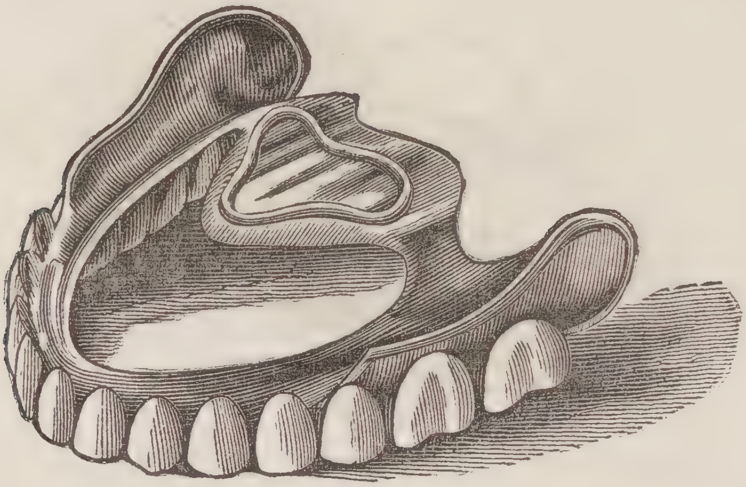


Fig. K.

making the plate so as to accomplish the desired object.—The central cavity is formed in the same manner as in cut J, though a different shape. As we cover but a small portion of the mouth with plate it is all-important to have that as strong and firm as possible; it is therefore necessary to get more stiffness to the front portion particularly, than can be obtained in one or two thicknesses of plate. We, therefore, after having the plate perfectly fitted and teeth soldered, cut a strip of gold so as to form an inner band, which is then soldered to the linings of the teeth and inner edge of the plate; this gives sufficient strength and firmness to the plate to bear ordinary pressure.

The teeth referred to as being lined by melting, originated with us seven years since. A short time after having adopted this method, we were informed that the same thing had been done in England and noticed in the American Journals, but as we have not to this day seen the notice referred to, we will give a short description of our "modus operandi."

We first get the exact shape and form desired for the lining by placing a strip of thin platina ribbon or foil, covering the inner surface of the tooth with flux, and the outer surface with plaster, then place gold sufficient to make the desired lining or backing, and melt with the blow-pipe, the gold will follow the platina plate. Where the lining is required to be thicker as at the base, it is done by turning up the edges of the platina.

There are some other peculiarities contained in our contributions to the Fair, but as we have already extended this article far beyond our original intentions, will let this suffice, at least for the present. Yours, truly,

AMBLER & AVERY,
31 Washington Place, New York.

ARTICLE VI.

The Importance of a more thorough Knowledge of the Dental Organs on the part of Physicians, to the successful management of many Diseases—and equally requisite, a more thorough knowledge of the General System by Dentists, for greater skill and success in the practice of their art. By W. R. HANDY, M. D.

IN the July No. of this journal for 1855, the first branch of the above subject was considered—we now invite attention to the second branch. To the first the attention of physicians was more particularly called, and the charge made of slighting the *dental organs*, in their anatomical studies, in comparison with the other organs of the body, and, as a necessary consequence, failure in the management of many diseases. To the second branch—which is the subject now before us—we ask the especial attention of the dentist, particularly the practicing dentist and dental student.

Dentists and students of dentistry are charged with the *want* of a more thorough knowledge of the *general system*, and, as a necessary consequence, failure in the acquisition of that skill and success so necessary and desirable in the practice of their art.

The importance of such thorough knowledge of the general system by the dentist, we are aware, is not generally acknowledged as necessary in the practice of his profession; and the acquisition of such knowledge, therefore, is considered a waste of time which might be more profitably spent in other matters. Regarding this point of great practical moment, we may be pardoned for appearing to dwell at some length upon it. This question involves the knowledge necessary to make a safe and skillful dentist on the one hand, and the health, happiness, and lives of suffering patients on the other.

The latter have no security without the attainment of this necessary knowledge by the former, and the former, without such attainment, cannot practice safely and honestly without injury to the latter.

What, then, is this necessary knowledge to make a competent dentist? The answer has been stated to be a more thorough knowledge of all the organs composing the human body.

The oculist and the aurist each practices his specialty—the one upon the eye, the other upon the ear; each confining his treatment to the one organ, and both alike declining to treat the body generally. Does it, therefore, follow that these physicians have no knowledge of any other organs except the eye and the ear, to which they devote most of their time, and upon which they exercise most of their skill? On the contrary, precisely the reverse of this seems to be the truth in the case, and that the physicians who practice these specialties of the eye and the ear are generally among the most thoroughly educated in every department of the healing art.

They acknowledge the necessity, and unhesitatingly pro-

claim it, that a knowledge of all the organs is absolutely necessary to a safe and trustworthy practice upon either the eye or the ear, and their professional brethren sustain them just because they have studied all the organs in all their relations, and are thereby best qualified to practice on any individual organ, and without such qualifications would not be considered as entitled to fellowship with the scientific physicians of any age or any land. But further, the people at large seem to think it not only necessary, but to require that a physician practicing in either of the specialties of the eye and the ear shall also be as thoroughly qualified as he who treats the body generally. But for the dentist who practices upon the teeth, there seems to be an exception in his favor. He appears to be a much more privileged character than either the eye doctor or the ear doctor. It is not considered very necessary, generally speaking, for him to know any thing about the body except the teeth, and even about them not much seems to be required. The dentist, therefore, in the judgment of the great body of the medical profession, as well as in that of the people at large, appears to be quite exempt from the extended qualifications thought so requisite in the oculist and the aurist. The dental profession is scarcely regarded as having any rights in common with the medical, and, therefore, as having little claim to equality of fellowship in the great family of physicians.

Now, we ask, why this difference—this great difference between the dentist, who practices upon the teeth as his favorite specialty, and that of the oculist and the aurist, who practice upon the eye and the ear as their favorite specialties? Why should the qualifications of the former be considered less necessary than those of the latter? And why should there be the less credit or the less dignity in the preservation of the teeth, than in that of either the eye or the ear? These questions bring us more directly to our subject, which is to examine the statement, i. e. that a more thorough knowledge of the general system by dentists, is requisite for greater skill and success in the practice of their art.

The first reason we have to assign why a general knowledge of all the organs of the body is as necessary to the dentist as to the physician who treats exclusively either the eye or the ear, is, that he is thus put in possession of all the resources of the body, whether for weal or woe, which may bear upon and influence the teeth, just as the physician who obtains a like knowledge of the resources and influences which the body brings to bear upon the eye and the ear. Each alike, dentist as well as physician, can turn the knowledge of such influences to a practical advantage, and in a twofold degree, first, by benefiting himself in greatly extending his skill and success; and secondly, by benefiting his patients in greatly adding to their health and happiness.

This reason is subordinate to one still more fundamental and conclusive on this point. We allude to the unity of the body and dependency of all its various parts.

That each organ is dependent, to a greater or less degree, on every other organ composing the human body, each upon the whole and the whole upon each, is, we believe, an acknowledged principle, and not called in question by any one.

Every organ, therefore, however inferior in function and position it may seem, is consequently related with every other organ, and exerts, according to the amount of its relationship, more or less influence upon each and all the organs. This being admitted, it appears to necessarily follow, that the teeth, as parts and organs of the body, must come in for their share of influence with each and all the other organs of said body. Granting such influence to exist, it must as necessarily follow that this influence is reciprocal, and that the relation of the teeth with the rest of the body, and of the body with the teeth, is as mutual and necessary for the preservation of health, as the acknowledged and necessary relationships of either the eye or the ear. If this be true, how can we avoid the conclusion, that it is not as necessary for the dentist to have qualifications as extended for successful practice upon the teeth, as that of the oculist and aurist for like success upon the eye

and the ear? And as a still further consequence, the absolute necessity of dentists, equally with physicians, making the whole body their study, that they may thus be the better prepared to practice any particular specialty? An objection here arises, and at one period was urged with some degree of plausibility, i. e. that the teeth, though admitted to be organs, nevertheless occupied so low a place in the rest of the organism, that their vitality was so small, and influence so insignificant, and that they had no circulation except what was seen in the pulse. We say, with such notions as these, it is not difficult to understand why so little importance should have been attached to the teeth, and why the qualifications of a dentist should be regarded of such little consequence.

But now, that this day is past, and we all know that the teeth are organs, that they are vascular, and that they are in full fellowship with all the other organs of the body —we say, knowing this, can there be any excuse why dentists should not, as well as physicians, properly qualify themselves for the duties they have assumed?

As there still, however, seems to be the belief, to a very considerable extent at least, that the qualifications of a dentist need not by any means be so extensive as those of a physician, we propose to try to prove that this is an error, and an error which, in our humble judgment, we think, greatly retards the progress of dental improvement as well as detracts from the dignity of the dental profession.

We here, in advance, take pleasure in acknowledging the many illustrious names, dead and living, that have adorned, and struggled to bring dentistry to its present eminence. We also cheerfully express our satisfaction and approbation of the dental colleges and dental societies that have every where sprung up in our midst, to elevate the standard of dental science and forward the march of dental progress. All of this seems clearly to show the necessity of more extended dental qualifications than have hitherto existed, and all such movements we hail as the harbinger of still brighter and better days to come.

To hasten, if possible, this result, is our chief aim at present; which brings us back to the error stated above, in which the belief is inculcated that dental qualifications are not very necessary, or at least only so to a very limited extent.

The first remark we have to offer is, that the health of the whole body involves the health of its several parts, or that general hygiene includes special hygiene and of course must include the teeth. This would seem to necessarily follow from the admitted fundamental position of the unity and dependency of all the various organs of the body.

It may not be amiss, however, to illustrate this point, in its bearing more especially upon the teeth.

Nutrition, it is well known, is one of the great leading functions of the body—to the whole and every part of the body. It consists of several subordinate functions, as digestion, absorption, respiration, circulation, secretion, and assimilation; and it is the result of the combined agency of these subordinate functions which constitutes nutrition. Its chief design is also well known to be the nourishment of the body; and among the organs for preparing this nourishment the teeth occupy a very important place, for they are found in the very front ranks of the process, are among the first to begin digestion, and are regarded as indispensable in the preparation of this universal pabulum for all the organs.

This general nourishment or pabulum, known as the blood, is distributed in due proportion to every part, so that the teeth must come in for their share. Now it will be observed that the teeth are employed, along with other organs, in manufacturing this blood, which is afterwards brought back to nourish and sustain these same teeth in the discharge of their important function. Here we see a reciprocation of duties between the teeth and the blood—a relation natural, close, and inseparable—and further, a relation so inseparable with health, that if you destroy it, you not only destroy the teeth and the blood, but likewise bring a proportionate ruin to every other part.

The importance and necessity, yes, we may add, the absolute necessity, of every dentist studying this relation between the teeth and the blood, seem self-evident; and not simply of studying it superficially and isolated, but thoroughly and connectedly; when it will be seen that this relation is not confined to the teeth and blood, but extends to and is felt in greater or less degree in every part. And this is true whether examined in a state of health or disease. Hence it follows, that before we can at all claim to know well even this relation, it is also necessary we should study every other relation with which it is associated. This can be very readily understood, when we but for a moment reflect that the *blood* is the grand reservoir of all the materials for all the organs, and that each organ, however great or however small it may be, is absolutely dependent upon this fluid blood for its very existence, development, growth, and future maintenance. The teeth form no exception to this universal law.

Now, if the blood be in a healthy or physiological condition, we expect to find all the organs in the same state of health; but on the other hand, if the blood be diseased we must expect the organs to be diseased likewise. It may not be amiss to ask here, what constitutes a healthy condition of the blood? as the answer will greatly help us in determining the extent of qualifications necessary to make a competent dentist.

Mr. Paget in his recent lectures on surgical pathology says, that among the many conditions necessary to normal nutrition, there are four which are the chief and most prominent, i. e.—

"1. A right state and composition of the blood or other nutritive material.

2. A regular and not far distant supply of such blood.

3. A certain influence of the nervous system.

4. A natural state of the part to be maintained."

Upon the right state of the blood he thus remarks: "I may observe that I use the expression right state rather

than purity, because if the latter be used, it seems to imply that there is some standard of composition to which all blood might be referred, and the attainment of which is essential to health; whereas the truth seems rather to be, that from birth onwards the blood and tissues of each creature are adapted to one another, and to the necessary external circumstances of life; and that the maintenance of health depends on the maintenance and continual re-adjustment of the peculiarities on which this exact adaptation depends." And he continues: "The necessity for this right or appropriate state of the blood, as a condition of healthy nutrition, involves of course the necessity for the due performance of the blood-making and blood-purifying functions; it requires healthy digestion, healthy respiration, healthy excretion. Any one of these being disturbed, the formative process in a part or in the whole body may be faulty for want of the appropriate material."

"But important as these are," he adds, "we must not let the consideration of them lead us to forget that there is something in the blood itself which is at least as essential to the continuance of its right and healthy state as these are, and which is, indeed, often occupied in correcting the errors to which these, more than itself, are subject; I mean the power of assimilation or maintenance which the blood possesses, in and for itself, as perfectly and at least as independently as any of the tissues."

And he further adds, that by this power of assimilation it is "that notwithstanding the diversity of materials put into the blood, and the diversity of conditions in which the functions ministering to its formation are discharged, yet the blood throughout life retains, in each person, certain characters as peculiar as those of his outer features, for the continual renewal of which it provides appropriate materials. And by this assimilative power of the blood it is that the tissues are continually guarded; for by it many noxious substances introduced into the blood are changed and made harmless before they come to the tissues; nor can any sub-

stance, introduced from without, produce disease in an organ, unless it be such an one as can escape the assimilative and excretory power of the blood itself."

Symmetrical diseases, and next to these homologous diseases, are cited by Mr. Paget as proofs of the nicety, constancy, and perfect exactness of the adaptation between the blood and all the tissues, and by which adaptation the health of all is preserved.

In the language of this author it is the "perfect and most minute exactness of the adaptation which, in health, exists between the blood and all the tissues; and that certain inconceivably slight disturbances of this adaptation may be sources of disease."

Again, from the writings of Treviranus, our author takes the following quotation, i. e. "that each single part of the body, in respect of its nutrition, stands to the whole body in the relation of an excreted substance," and makes this comment upon it: "If each part," he says, "in its normal nutrition is as an excreting organ to the rest, then the cessation or perversion of nutrition in one must, by no vague sympathy, but through definite change in the condition of the blood, affect the nutrition of the rest, and be thus the source of constitutional disturbance."

From these quotations we wish to make a remark as showing their practical bearing upon the teeth, and the consequent practical qualifications of the dentist, necessary in view of such relation. This practical relation is equally strong and direct with every other organ, but as we are most concerned, at present, with the relation of the blood and teeth, we pass by any particular notice of the rest.

It is conceded on all hands that the teeth have a birth, development, growth, maturity, decay, and death, as all the other organs, and that they likewise have blood-vessels and nerves as the rest, thus giving them both circulation and sensation. Mr. Goodsir tells us that the germs of the temporary teeth are seen as early as the seventh week after conception, and that about the fourteenth week provision is

being made for the ten anterior permanent teeth. The child is now in the mother's womb, and the teeth are developed and grow from the mother's blood. After the child is born the teeth continue their development and growth from the mother's milk till the time of weaning, when it assumes an existence independent of the mother, and takes other food. Here, then, we observe three great periods in the formation of the teeth: the two first being absolutely dependent on the blood of the mother for the original soundness and good constitution of the teeth; while the latter period depends upon the after diet for the perfection of this soundness and its future preservation.

The infant, it is well known, has twenty teeth; the youth twenty-eight; the man thirty-two. The infant's number, we are told, is not completed till about the thirtieth or thirty-sixth month, and are not all shed till about the thirteenth or fourteenth year. Now both sets of teeth are under the especial care of the dentist; he is consulted daily about them, and it is his duty to watch and protect them in their infantile and youthful development and growth as the only security to the future man of a sound and healthy denture. And how, we respectfully ask, can any honest man do this, or even presume to attempt to do it, when he is most profoundly ignorant of the very first principles of the science upon which his practice is based. These principles teach that he should know the character of the blood supplying the teeth of the infant in the mother's womb; that he should know the character of the milk furnished by the mother after the child is born, and finally, that he should know the character of the diet, to be formed into blood, for the teeth of youth and manhood. For from these three sources are drawn all the materials required for the construction of the teeth during these three periods of their development and growth. And if these sources be corrupted, and thereby incapable of supplying a proper, healthy material, it is impossible that we can have formed sound and healthy teeth. A knowledge of the first source,

the material blood, requires an acquaintance with the constitution and habits of the mother and the condition of her organs as to health and disease by which her blood was formed, and which knowledge is the only safe criterion to the dentist in advising the patient about her health, as well as forming a proper estimate of the condition of the teeth of her future offspring, provided she does not heed his advice. The second and third sources, differ from the first, by being required to be formed into blood before they are fit to supply the teeth with proper nourishment, and this requires the additional study of the infant's constitution, with all its tender relations and most delicate susceptibilities. Now all such knowledge as this includes no less than a knowledge of anatomy, physiology, pathology, and hygiene; in other words, a knowledge of all the organs in all their relations, both in health and disease. But such qualifications as these are disclaimed as unnecessary—we have no allusion to the scientific dentist—and brings us back to our original complaint, that no dentist without such knowledge is competent to discharge his duty to his patients.

Dentists are often consulted as to the proper time of weaning a child. This is a point connected with nutrition, and is of great practical importance to the future well-being of the little patient.

The last number of the Dental Journal contains a clinical lecture by M. Trousseau upon this subject. He says, "the teeth of infants come out in groups. The first group consists of two middle inferior incisors at about eight months; second group, two middle superior incisors, at about ten months; third group, two lateral superior incisors at about a year; fourth group, two lateral inferior incisors and the first four molars (six teeth in this group) at fourteen to sixteen months; fifth group, four cuspids, at eighteen months to two years; sixth group, four second and last molars, at thirty or thirty-six months."

The practical point here is, the period of repose between each group, and which M. T. insists is the only proper and

safe time for weaning; and even then not too soon, as the delicate state of the child's bowels, with its strong disposition to cholera infantum, would certainly endanger life from this disease, if the mother's milk be withheld. M. T. prefers waiting for the interval after the fourth group, or until the child has twelve teeth, before you advise weaning, as the organs are now better adapted for digesting and assimilating the new food with which it is provided; and it is this adaptation of the food to the organs, a knowledge of which enables the dentist to give an intelligent reason for this advice, which is so anxiously sought in this trying period of the child's existence.

Our remarks upon the blood, in its relation to the teeth, having already extended so far, allows us but a brief space for the few additional points we had proposed to notice. This, however, is the less to be regretted, as the blood is the fundamental and starting point to the dentist in all his investigations into the various qualities of the teeth, a thorough knowledge of which in its relations, not with one but with every organ, forms the chief basis for estimating the amount of influence which the various organs have upon the teeth, and the teeth upon the different organs, so that by being able to judge properly of this reciprocal influence he is able to turn the whole to practical account, and by so doing, to attain to far greater skill and success in his dental operations.

The organs related with the teeth, it has already been stated in a general way, comprise those of the whole body; and we shall here simply and briefly enumerate those only which are most prominently related with the teeth, as for example, the *salivary glands*, which furnish the principal fluids to the mouth, and which, along with the mucus, bathe the teeth, can from the character and action of these fluids be the means of either their preservation or destruction.

The *stomach* is directly connected with the mouth and the teeth, by means of a continuous mucous membrane extending through the pharynx and œsophagus. The con-

nection is equally close by function, as both are engaged in the process of digestion—the one at its beginning and the other near its completion.

The *intestines*, small and large, come next, and are related by this same continuous mucous membrane, having poured into them a variety of fluids from various quarters: 1st, from the countless little glandular bodies within the coats of the tube itself; and second, from the liver and pancreas furnishing the bile and pancreating fluids, through whose agency it is known that the chyle is formed. Now this chyle, sometimes known as the white blood, owes its proper constitution entirely to the healthy relation existing between the dental organs on the one hand, and the intestines, with their appendages, on the other hand.

The *lungs* are also connected with the teeth and mouth by the mucous membrane extending down the trachea and bronchi, through which the air is constantly passing and repassing, and thus reciprocally affecting either class of organs accordingly as the air may be charged with gases that are deleterious.

The *brain* is directly connected with the teeth through the fifth pair of nerves, and often throws the system into the most violent convulsions during dentition.

The *uterus* is related with the teeth, but precisely in what way, is rather difficult to say; possibly, through Mr. Paget's theory of complemental nutrition, or through the spinal marrow and fifth pair of nerves. But the fact of the relation itself is unquestioned. Delabarre relates the following case:

"I know a lady of thirty, who, ten years ago, was of a fine constitution; her teeth were of an excellent quality; her gums fresh, and the small arterial vessels of the lips of a beautiful color. A painful delivery occasioned great disturbance in the economy; the matrix remained diseased. Then, there was great paleness of the gums and lips, on which soon but a few red vessels were perceived; the saliva was very stringy. One day, without the advice of the phy-

sician, she applied leeches; and the blood was very pale and serous. The general debility was necessarily found to be increased. Soon the teeth felt the want of sanguification; they were spotted in different places; caries was developed, and all local endeavors to restrain it were for a long time ineffectual; they rotted below the enamel, occasioning dull pains, and the caries presented a large excavation; a part of the osseous centre of each tooth was softened, its calcareous phosphate having been absorbed. Four were in a short time destroyed; but, finally, nature, seconding the efforts of the physician, her health was restored."

Though we do not assent fully to some of the explanations given in this case, yet it suffices to show the closeness of the relation between the teeth and the uterus, and the necessity of the dentist being familiar with this relation in his operations; otherwise he might destroy teeth not at all diseased, but only sympathetically affected.

The *spinal marrow*, from the recent experiments of M. Brown Seguard, before the French Academy of Sciences, when injured, is shown "to produce such a change in the vitality of the trigeminus nerve, or in that part of the brain at which this nerve terminates, that the excitation of its ramifications upon the face causes convulsions. The right half of the spinal marrow exerts this influence upon the right trigeminus nerve or right side of the brain, while the left half of the cord exerts the same influence upon the left nerve or side of the brain."

The nerve here spoken of is the fifth pair, which, besides supplying the face, is freely distributed to the teeth of both upper and lower jaws by means of its superior and inferior maxillary branches, thus establishing the connection between the teeth and spinal marrow, and the reciprocal influence of each in its departure from health.

The last remark we shall offer is to very briefly notice a few of the constitutional and other disturbances which affect the teeth.

Schill, in his Semeiology of the Teeth, says that in

scurvy, phthisis, and scrofula the teeth are elongated, arising, however, he adds, from "retraction of the gum." That in scurvy, and from the use of mercury, they are less firm.

In typhus fever the teeth are coated with a brown and dark sordes, while a white coat is produced from a variety of affections.

In chlorosis and anæmia, this same authority describes the gums as pale, which is confirmed by general experience. In hemorrhoidal discharges and dysmorrhea the teeth are a purple red; and in scurvy, diabetes, mellitus, and from the use of mercury, a dark red.

"The receding of the gums from the necks of the teeth, and the process of denudation," says Mr. Waite, "depend either on a peculiar state of the system, or some constitutional cause."

It is unnecessary to multiply further examples, as we trust enough has been already said to prove that the qualifications of the dentist to practice with the highest efficiency upon the teeth as his favorite specialty, are and should be as great as those required of the physician, who takes any other specialty, as the eye and the ear, for example, for his especial practice.

For it must be remembered by the dentist that the teeth, equally with the eye, the ear, or any other organ or set of organs, are members also of the same body; have relations in common with the rest of the body; mutually act and react with each and all the organs; are consequently influenced by all, and must therefore be studied in connection with all, for the greater skill and success in his own especial department.

ARTICLE VII.

Diseases of the Maxillary Sinus. By Dr. J. A. Giraldes, Professor agrege a la Faculte de Medecine, &c. &c., Paris. Translated by Dr. Christopher Johnston, Baltimore.

Anatomical Considerations.—The superior maxillary bones constitute the principal part of the facial skeleton; their form, their volume contribute to give the physiognomy the particular traits which characterize different races, and impress upon the physiognomy of individuals those numerous peculiarities which are met with in the same family at different epochs of life, in the child, the adult and the aged. The modifications which belong to epochs result especially from the transformations through which the superior maxillary bones pass before reaching their perfect development. At birth and in early life, the superior maxillary bone is hardly developed, but it contains within it important organs which, during their own perfecting, give it a new form; it consists of a spongy tissue, of which the meshes are eventually pushed back to lodge a mucous sac, a dependence or process of the Schneiderian membrane, destined ultimately to line a great cavity—the MAXILLARY SINUS. There is, consequently, a difference between the superior maxillary bone of the child and of the adult; this difference, besides other peculiarities, consists in the presence of a cavity—a sinus—which increases the volume of the bone without augmenting its weight—a sinus still known as the antrum of Highmore.

We will now examine this sinus rapidly, and especially in a surgical point of view.

The antrum of Highmore, in opposition to the belief of some, was not discovered by the anatomist whose name it bears; others before him had noticed it, but Highmore*

* Highmore, corporis humani disc. anatomica Hagæ, 1651, p. 226, tab. xvi.

has the merit of having best described it, and above all of having best established its relations with the roots of the molar teeth. And especially is it since he put forth his description of the sinus, made more conspicuous by means of an enlarged but exact figure, that the importance of this anatomical point has been fully appreciated; and it is only since that time that various diseases of the antrum of Highmore have become known to us.

The maxillary sinus occupies almost entirely the superior maxillary bone, and is hollowed out of that part of the os maxillare which is independent of the incisor teeth —it constitutes a great cavity of quadrangular form, having the figure of a quadrangular pyramid: the base corresponds to the nasal fossæ, and the angles and edges are rounded correspondingly to points of the maxillary bone, which deserve mention. The superior face answers to the floor of the orbit, and the anterior to that point of the bone known as the canine fossa; at this spot the weakness of the wall allows of easy penetration into the sinus. The external face looks a little backwards. The inferior, rounded border is in direct relation with the roots of the molar teeth which sometimes penetrate into the cavity of the sinus, being separated from it by a thin, porous lamella only, which offers no obstacle to the operator. The anterior and inner angle may extend even into the base of the ascending process; the external angle corresponds to the molar process, and occasionally penetrates it. The dimensions of this cavity vary with the individual, and especially according to age; sometimes its walls are depressed, pressed inwards, and then its cavity is narrowed. The sinus may even completely disappear, as in a case cited by Morgagni.* In some instances, partitions divide the cavity into several compartments; but a more important point, one which did not escape Highmore, is the variable thickness of the walls, which not unfrequently are constituted solely of thin lamellæ very easily broken.

* Advert. anat.

The cavity of the sinus communicates directly with the nasal fossæ. It is lined by the Schneiderian membrane, which, in penetrating into the antrum, becomes thinner without losing any of its characters. Like that of Schneider, it rests upon periosteum attached to it by an easily demonstrable areolar tissue. This periosteum is provided with nerves derived from the dental nerves, which enter its tissue and are therein distributed, whilst other branches lie in contact with it; these nerves proceed from the fifth pair.

The membrane of the maxillary sinus offers differences in thickness in different points; it is thicker on the inner surface—that in relation with the nasal fossæ—than elsewhere; it is more vascular there and is richer in mucous glands. Besides, all the surface of the membrane is covered with a cylindrical epithelium.

The cavity of the sinus communicates with that of the nasal fossæ by an opening the size of a crow's quill. This aperture, sometimes double, is placed at the upper part of the middle meatus, overhung by the corresponding turbinated bone, and it ends in a depression common to the ethmoidal and frontal sinuses. It is easy to perceive that owing to varieties in the volume and form of the turbinated bone, catheterism of the maxillary sinus may be oftentimes difficult; and that in attempting to traverse the opening the wall may be perforated, a fact which has been established by the commission of the academy of surgery.

The maxillary sinus presents still other varieties depending upon the different phases of dental evolution. Before the development of the last molars its posterior and inferior part is occupied by the bulb, and the periosteum of the sinus is in intimate relation with these organs, which explains some of the disturbances propagated by continuity of tissue in the cavity of the sinus, in consequence of impediments which the dental organ finds opposed to its normal development. Further, in many cases abnormal teeth are met with in this cavity, and they produce diseases of which we will presently speak: and

finally, the attentive examination of the anatomical disposition of the maxillary sinus, of its volume, of its relations, informs us how diseases of neighboring parts may invade it, obliterate its cavity, and suggest the existence of an affection developed in its interior.

Chapter II.—*Pathology.*—The maxillary sinus is a cavity with osseous walls covered with a periosteum, and lined with mucous membrane; the diseases of which it is the seat ought necessarily to originate in one of these three parts—the bone, the periosteum, and the mucous membrane. But this distinction, sufficiently correct in an anatomical point of view, cannot be maintained in a clinical survey; wherefore, we will not pursue it, adopting in preference, for the following study, the physiological order.

The maxillary sinus performs functions of which we have nothing to say; but there take place in its tissues phenomena of nutrition, the disturbance of which may provoke the development of lesions, which are the diseases observed in it. It may also, like any other part of the body, be the object of external violence. The diseases to which it is liable are consequently of two orders; the first are produced by external violence; the others on the contrary are the result of a modification of nutrition, involving exudation of plastic fibrinous matter susceptible of being converted either into *pus* or new tissues. We divide, then, our subject into two parts: 1st. Traumatic lesions; 2d. Diseases produced by an alteration or perversion of nutrition, the latter determining the products which I have just pointed out.

The first group comprehends fractures and contusions. In the second we place inflammation, its sequelæ, and the tumors or accidental products developed from a local cause or a general condition of the organism.

Section I.—*Traumatic Lesions.*—Under the title traumatic lesions I include every lesion produced by a mechanical cause; these are contusions, fractures, effusions of blood. Finally, in a concluding paragraph, I will treat of

foreign bodies that may be met with in this cavity, having been introduced into it by external violence.

1st. *Contusions and Fractures.*—Fractures of the maxillary sinus are almost always accompanied with contusion of the surrounding parts, and ought not to constitute a distinct chapter. For instance, when the anterior part of the face receives a violent blow, it seldom happens that the surface corresponding to the sinus is alone crushed; almost always the lesions extend more or less on every side. Nevertheless, in rare cases the sinus may be directly contused and beaten in. A thrust of a foil, of a bayonet or of a sabre, sometimes produces this result. Beclard relates the history of a man who had received a blow from an umbrella stick in this region; the ferule of the umbrella fractured the bony walls of the sinus, and, becoming detached, lodged in the cavity.

In other instances the lesions are spread over a more extended surface. Brodie* cites the case of a child which, having received a violent blow upon the cheek, presented a tumor in this region, and eventually necrosis around the sinus.

2d. *Effusions of Blood.*—Contusions of the anterior part of the cheek may, in some instances, give rise to effusion of blood in the sinus. Dupuytren† received in his wards a young girl, who entered the hospital for a tumor of the face resulting from a blow. An augmentation of volume was observed in the region; the eye projected out of the orbit;—two days afterward Dupuytren plunged a bistoury into the tumor, whereupon a certain quantity of blackish blood escaped at the incision. The finger pressed into the cavity of the sinus encountered a soft and lacerable mass; and the next day the surgeon, widening the opening, withdrew two ounces of blood. Jourdain‡ relates that a young lady, fifteen years of age, had an effusion of blood

* London Med. Gazette, vol. xv, p. 346.

† Dupuytren, cl. chir. t. iii.

‡ Recherches sur les mal. du Sinus Max. Jour. de Med., 1757, tab. ii, obs. v.

into the sinus in consequence of fracture of the dental arch. Knorz* speaks of having met with a sanguineous effusion at the same point, in a man who died after a fall from a great elevation. These facts, and another instance observed in 1847 in the wards of Prof. Velpeau,† afford evidence that sanguineous effusions really take place in the maxillary sinus; that the blood there undergoes some of the modifications noticeable in effusions elsewhere, that it may coagulate or even pass into decomposition.

Sanguineous effusions in the antrum may sometimes give rise to inflammation in that cavity; this condition is evidenced by pain in the upper jaw, and by formation of a tumor in the region of the cheek extending at times to the orbitar side. It is of consequence to be acquainted with the fact that these effusions may have added to them the matters secreted in the cavity and the serosity poured out by an irritated mucous membrane. Under the supposition that the tumor is malignant, the surgeon will verify his diagnosis by means of an explorative puncture; he will thus assure himself of the presence or absence of a liquid and of its nature. If any exist, he may also employ the means indicated by M. Bermond,‡ a means not recommended by experience. According to this surgeon, whenever the sinus is filled with fluid, the presence of the latter may be ascertained by auscultation of the jaw. In the normal condition, says this author, the passage of air into the cavities of the maxillary sinuses occasions a *bruit*—a sound—which is absent when these are filled with fluid.

The *treatment* of fractures and contusions is comprised in the study of fractures of the bones of the face. It consists in combating existing complications, and in abstaining, even in comminuted fractures, from extracting the fragments, unless they produce disturbance.

* Knorz, De maxillæ superioris in primis ejus sinus morbosis affectionibus. Marb., 1844.

† Gazette der Hopitaux, 1847, p. 289.

‡ Gazette Med. de Paris, t. ix, p. 253.

When blood is effused into the sinus, especially when its presence provokes inflammation, it is indispensable to give it exit. For this purpose a perforation may be made in the sinus, or else the extraction of one or two carious teeth may allow of penetration through the alveoli, and of removal of the liquid by means of injections.

3d. *Foreign bodies in the Sinus.*—Foreign bodies met with in the maxillary sinuses have always entered these cavities by traumatic lesion; they are fragments of iron, of projectiles urged by gunpowder, of stones, &c.

Ravaton* relates the history of a Swiss sergeant who, at the battle of Rosbach, received a bullet under the orbit. The wound remained fistulous a long time, but the ball was at length discovered. Dupuytren tells us of an officer into whose sinus a ball had penetrated. In Beclard's case also, the umbrella ferule was retained for a considerable period.

The presence of foreign bodies in this cavity maintains suppuration and renders fistulous the wounds by which they obtained access; and through the fistula they may generally be recognized with a probe. In the memoir of Bordenave occurs the history of a young man bearing a fistula in the cheek maintained by a plug of lint. Allonel† cites the observation of a gun-shot wound of the cheek made fistulous by a morsel of shell. We must also regard as foreign bodies the lachrymal cannulas inadvertently introduced into the cavity of the sinus. Finally, some authors, Pallas‡ amongst them, speak of the presence of worms, lumbrici, &c., in the maxillary sinus; but observations relating to facts of this nature are not sufficiently detailed, and are in some instances unreliable.

Foreign bodies lodged in the antrum ought to be removed—their presence not only rendering wounds fistulous, but also giving rise to erysipelatous disturbance of more or less gravity.

* Chirurgien d'Armee, 1767, obs. 31, p. 181.

† Mem. de l'Acad. Roy. de Chir. t. v.

‡ De insectis viventibus intra viventia.

SECTION II.—*Inflammation.*—It is only since Nathaniel Highmore described the maxillary sinus, that its diseases have been studied—diseases which before his time were confounded under the denominations *epulis*, *ozœna* and *polypus*, for in looking over ancient authors, it is easy to recognize by these appellations the principal features of affections developed in the maxillary sinus. In the last century only did surgeons advantageously study diseases of the antra; and Ringue* and Jourdain† especially invite attention to the subject. Subsequently Bordenave‡ includes in two memoirs read before the Royal Academy of Surgery the most important matters in connection with diseases of the maxillary sinuses. But above all, to the impulse given to pathological anatomy on the one hand, and to the advance of operative medicine during this century on the other, are we indebted for a clearer acquaintance with diseases of these cavities. Surgery now opposes an important operation against the invasion of tumors, and this is amputation or resection of the superior maxillary bone, as conceived and practiced by Lizars ‖ and Gensoul.§

However, since surgery was enriched with this important discovery, the pathology of the sinus has remained stationary, and a regretable confusion still reigns in the study of diseases seated in this cavity. We even venture to assert that the pathology of the sinus yet remains to be made out, and that the morbid products therein developed call for fresh examination with and without the *microscope;* and it is only when these studies shall have been made that a distinction may be established between the now confused abnormal products, that the gravity of all these affections will be appreciated, and that the proposed operations may be safely adopted or wisely rejected.

* Haller. disputationis chirurg. de morbis præcipui sinuum, t. i, dis. xi.
† Journal de Med., 1767.
‡ Mem. de l'Acad. chir. obs. iv, et v.
‖ Anatomical plates, t. ii, part ix, 1826.
§ Lettre chirurgicale.

Section I.—*Inflammation of the mucous membrane of the Sinus.*—Inflammation of the mucous lining of the maxillary sinus may be either acute or chronic. It occurs after fractures, wounds, blows upon the cheek or the teeth, &c.; but it is most frequently met with as a phenomenon of contiguity accompanying inflammation of the alveolar periosteum, complicating dental caries. Some authors, Jourdain and Brodie* amongst others, are of opinion that inflammation of the membrane of the sinus often depends upon an internal cause, such even as rheumatism. Jourdain endeavors to show that in many cases this inflammation ought not to be referred to the presence of a carious tooth. Rust† admits that internal causes most frequently give rise to this inflammation. He even distinguishes inflammation of the fibrous membrane of the periosteum, from that affecting the internal or mucous membrane; he entitles the one *gengantritis* and the other *eiagantritis*, and he refers both to general causes.

Inflammation of the maxillary sinus manifests itself by local and sympathetic symptoms, and by general symptoms.

Local Symptoms.—A lively and intense pain, deep in the jaw, extending from the side of the head and the ear, accompanied with great sensibility of the eye, lachrymation, ringing in the ears, great tenderness at the roots of the teeth, becoming acute pain upon the slightest touch, together with swelling of the face and persistence of the pain.

General Symptoms.—Fever, a state of irritability, nervous exaltation, sometimes vomiting and occasionally delirium.

Diagnosis.—Inflammation of the mucous membrane of the sinus frequently coincides with inflammation produced by a carious tooth; indeed we often meet with all the symptoms just enumerated resulting from the latter cause. But it deserves mention that when the inflammation is provoked by a carious tooth, by inflammation of the dental periosteum, the pain, after a certain time, diminishes

* London Med. Gazette. † Encyclop. Wærterbuch der Med. Niss., t. iii.

instead of increasing. In inflammation of the membrane of the sinus, on the contrary, the pain is more persistent, more intense and more vexatiously enduring.

Inflammation of the sinus may terminate in resolution and suppuration. When it follows after dental caries it is probably a concomitant symptom, and ends in resolution.

When suppuration is once established, an abscess or purulent accumulation is formed in the sinus, and the walls dilating, a tumor appears upon the cheek. Jourdain* gives the case of a nun whose maxillary sinus presented this condition for a year, and was accompanied with œdema of the face. Beaupreau† tells us of a woman aged twenty-five years whose antrum was distended with pus. M.Cloquet‡ saw in the Clinical Hospital a patient aged thirty years in whom the maxillary sinus formed a tumor in the cheek as large as a hen's egg. Dilatation of the sinus, in some instances, occurs not only externally but also towards the orbit. Boeneck§ records an observation of a woman aged sixty years, in whom this condition obtained.

Purulent accumulation in the maxillary sinus keeps up an irritation there; the pus mingling with mucus increases the quantity of fluid contained in the sinus, which undergoes considerable dilatation, as in the case of Boeneck.

When the abscess is formed there follows a process of erosion; the tumor pierces the osseous walls; it finds an issue either towards the mouth or else the nasal fossæ. The purulent matter irritates the mucous membrane, rendering it thick and spongy, as in Beaupreau's case, and in another instanced by Gooch, and the suppuration is maintained.

The osseous walls of the antrum may be affected;—they are oftentimes carious. Gooch‖ observed an abscess of the maxillary sinus of three years' standing which had occasioned caries of the bone. In these cases fistulæ are

* Loc. cit. † Mem. de Bordenave. ‡ Lancette Francaise, t. x, p. 82
§ Gazette Med. ‖ Caries in Surgery, vol. ii, p. 63.

formed, and are kept up by the carious condition of the osseous walls of the sinus. Observations of this kind are met with in the work of Jourdain and in the memoir of Bordenave.

Let me remark, however, that abscess of the antrum may continue for a long time without perforation, as appears by the case referred to of Gooch.*

Progress and Diagnosis.—When abscess forms after inflammation of the lining membrane of the sinus, its existence is recognized by a tumor in the cheek which has been preceded by sharp pain, persistent and intense. This tumor increases, distends the sinus and occasions phenomena of compression, especially towards the orbit. When the abscess is of some standing, when, more particularly, it formed without antecedent sharp pains, as in the case of Cloquet, the distinction becomes more difficult, and the abscess might be mistaken for dropsy of the maxillary sinus, unless an issue of pus through the nares, or an explorative puncture, assist the diagnosis.

Treatment.—The treatment of inflammation of the maxillary sinus is either local or general. Whenever we can satisfy ourselves that the disease of the sinus is not dependent upon a general or specific cause, antiphlogistic treatment ought to be employed. Leeches in numbers upon the cheek or the gengival mucous membrane; cataplasms, fomentations and emollient fumigations may be used with advantage. The general treatment consists in diet, purgatives, calomel in doses of 4 or 6 grains; and besides, an especial medication is required when the phlogosis depends upon a *specific cause.*

When the inflammation ends in suppuration—in abscess—when, for instance, fistulæ exist at the level of the alveolar arch, &c., what course must the surgeon pursue? When abscess is recognized, must it be opened, and at what point should the opening be made? Does the ab-

* Medical Times, 24th August, 1850.

scess project at some particular spot? Is it accompanied with dental caries? In the first case a free opening should be made in the most depending portion; afterwards injections are to be employed to expel all residual purulent matter; and finally, iodureted water is advantageously injected into the sinus in order to effect a modification of the mucous membrane of the cavity.

In the second case, that is to say, when the teeth are carious, it is highly advantageous to remove the diseased teeth, to perforate the bottom of the alveolus, and to widen the aperture (as did Meibomius) to admit the passage of the injections already mentioned. Jourdain insists upon the employment of injections made through the nasal fossæ; but, as we have already remarked, catheterism of the maxillary sinuses is fraught with difficulty; and it was ascertained by the Commission of the Academy of Surgery* that in the majority of cases, the catheter had perforated the wall of the nasal fossæ. It is an incontestable fact that the use of injections in purulent collections of this region, as elsewhere, gives excellent results. We will remark casually that M. Hullihen† claims to have cured *tic douloureux* of the face by means of injections of nitrate of silver thrown into the maxillary fossæ.

Abscesses of the antrum of Highmore which open spontaneously often occasion fistulæ, and these are kept up either by the condition of the bone, of the mucous membrane, or by their elevated position. When such fistulæ exist it becomes necessary to ascertain the true state of the sinus, of the bone and of the teeth. It is also requisite to explore the tract of the fistulæ and the diseased cavity; and, if necessary, to make a puncture at a more depending point. If caries exist, iodureted or other injections should be used; if necrosis be present, the sequestra should be extracted. But necrosis, be it observed, is less frequently a sequel of abscess than a result of disease of the max-

* Henr. Meib. de abscessum internorum natura et dissert., 1718.

† Hullihen, Charleston Med. Journal, 1839, vol. iv, July No. 4, p. 50.

illary bone, and usually follows contusions and affections of the cheek. Baron* describes an affection of the cheek in children in which the superior maxillary bones were necrosed. The instance cited by Lassus of "necrosis of the sinus" is rather necrosis of the superior maxillary. The same may be said of those necroses produced by phosphureted vapors, and described with much care by Bibra, Geist† and M. Heyfelder.‡

SECTION III.—*Dropsy of the Maxillary Sinus.*—Under the denomination, dropsy of the maxillary sinus, Deschamps (the son) described a morbid condition of the sinus, characterized by dilatation from an inclosed accumulation of a white or slightly yellowish glairy fluid.

This dilatation is always accompanied with thinning of the osseous parietes of the cavity. Dilatation and accumulation of a non-purulent liquid are the principal features of the disease; and these characters, as will presently be seen, serve to distinguish it from another affection with which it might be confounded, namely cysts developed in the thickness of the jaw. But before Deschamps drew the attention of surgeons to this disease, Runge had already given to the world an observation of dropsy of the maxillary sinus.

If we examine the maxillary sinuses of a great number of crania, we encounter very important peculiarities which explain the varieties of form assumed by this dropsy. Often the cavities are dilated, sometimes in their whole extent, and their thinned and transparent walls are easily depressed with the finger, but they return to shape with a characteristic noise; or else, on the contrary, they are as brittle as mica. In other instances the dilatation is directed outwards; it then effaces that bevel running from the molar apophysis, and there forms a swelling. In other cases, again, it is the anterior part of the sinus which un-

* Bulletin de la Faculte de Med., vol. v, p. 151.

† Die Krankheiten in den Phosphorzundholzfabriken, Erlang, 1847.

‡ Medic. lit.

dergoes dilatation; it is now prolonged into the ascending or nasal process of the superior maxillary bone, and forms, in the dry bone, a rounded tumor of variable size. Sometimes the upper and posterior parts of the sinus are alone affected; and there exists behind the orbit a tumor which constricts the maxillary fissures as well as the apex of the orbitar cavity. Finally, in some instances, the dilatation directs its course backwards towards the molar tuberosity, and extends, not unfrequently, into the thickness of the dental arch.

Dropsy of the maxillary sinus is thus manifested: Delavacherie* records an observation of a man thirty-six years of age, in whom the dilatation of the sinus was continued into the nasal fossæ and the palate, and caused a twisting or deformity of the wings of the nose. M. Bertrand† noticed a dropsy of the sinus in a man aged thirty-seven years; the dilatation of the cavity extended as well into the mouth as the nose, the nasal process being much distended. In the two cases I have mentioned the osseous walls had become extremely thin, and yielded to pressure; indeed, they allowed the finger applied against one side of the tumor to receive the pressure of another finger compressing a distant point of it.

The nature of the liquid contained in the sinus is subject to variation; sometimes it is thick and ropy, and sometimes it is less tenacious and slightly colored. The chemical composition of this fluid is not given; but we may state that in a case observed by Ferguson‡ it contained cholesterine. The difference in tenacity, consistence and color depends upon undetermined causes.

Causes.—It has been supposed that these dropsies were owing to stricture or obliteration of the communicating canal between the sinus and the nasal cavities, the accumulation of the liquid in the sinus being thereby facilitated;—this is pure hypothesis, and no observation has been

* Memoire sur quelques Maladies de la Machoire, Bruxelles, 1843.

† Lombard, These de Montpellier, 1836. ‡ Medical Times, May 1850, p. 368.

adduced to prove it. The cause assigned by T. Bell* for the formation of these fluid collections is more plausible. According to this author, they depend upon a modification of the mucous lining membrane: a modification brought about by the process going on in the roots of the teeth. In some instances the existence of serous collections in the sinus was coincident upon the presence of abnormal teeth in its cavity. The facts noticed by Dubois and Gensoul,† of incisor teeth formed in the cavity of the sinus, furnish examples of this condition.

Diagnosis.—The diagnosis of dropsies of the maxillary sinus is justified by the presence of a tumor of the os maxillare projecting in one of the aforementioned points; by the yielding nature of the walls of the sinus, which may be depressed and then return upon themselves with a noise like that produced by parchment rubbed between the fingers. But still, in truth, it is possible to mistake an osseous cyst of the maxillary bone for a collection in the sinus; but here the error would be unimportant, since the means employed to cure either of these diseases is equally applicable to the other. The mistake, however, becomes of consequence when dropsy of the sinus is confounded with any other tumor except a cyst. Thus Ferguson had charge of a patient who had been sent to him as affected with disease of the upper jaw, requiring its oblation. The same may be said of the observation of M. Bertrand.‡ Nevertheless, in some exceptional circumstances, surgeons of great experience have mistaken dropsy of the sinus for other diseases of it. Gensoul§ cites an instance. This surgeon having prepared himself to perform resection of the upper jaw, and even taken the first steps in the operation, perceived, as he was about to plunge his instrument into the os maxillare, that he had to do with a dropsy of the cavity of that bone.

* Notes, "Treatise upon the Teeth," by Hunter.
† Bull. de la Societe de la Faculte, t. i, p. 107.
‡ Bull. de la Societe de la Faculte, t. i, p. 107. § Loc. cit.

Prognosis.—The prognosis of this disease is not serious. If the affection be left to itself, the distention of the bone will increase, and will be complicated by disturbances created by the compression of surrounding parts; disagreeable enough, it is true, but which in no wise involve the constitution.

Treatment.—Dropsy of the antrum being an accumulation of fluid, which tends to increase every day, its treatment offers an indication as positive as rational, which is the evacuation of the contained liquid. This operation may be done through the nasal fossæ, the canine fossæ, the palatine vault, and finally through the alveolar processes. The point of election is that at which the tumor is most conspicuously developed. The evacuation of the fluid through the alveoli is only conventional; it ought to be rejected, unless, indeed, a carious tooth requiring evulsion should offer in its bed a favorable channel for the discharge of the accumulation. The instrument best adapted for the operation is a bistoury or a trocar. With the first, the operation consists in making an incision which is to be kept open for several days; with the second, it consists in a simple puncture. The tumor being pierced, its contents escape, the walls of the sinus collapse, and after a certain time the cavity resumes its normal dimensions. In some instances, however, the opening remains fistulous. Brodie* records an observation of dropsy of the sinus, in which, after being operated upon, the opening remained fistulous for ten years. The observation of Sauve is equally to the point. It was to avoid the inconvenience of a fistula that Blandin had recourse, in one case, to puncture through the alveolus; and he placed in this cavity a pivot-tooth, which enabled the patient to evacuate at pleasure the fluid that accumulated in the maxillary sinus.

* Loc. cit.

[To be continued.]

SELECTED ARTICLES.

ARTICLE VIII.

On Certain Conditions of the Dental Tissues. By John Tomes, F. R. S., Surgeon-Dentist to the Middlesex Hospital.

The temporary teeth, when about to be replaced by the permanent set, lose their fangs by gradual absorption of their substance. The crown, when thus left, having but little hold upon the gum, soon falls out. The manner in which the absorption of the dental tissues is effected has been described in a paper published in the "Philosophical Transactions," in 1853. The subject is there mentioned in connection with the absorption of bone.

Having latterly had occasion to devote considerable attention to the phenomena attending the casting off of the deciduous teeth, several conditions relative to absorption have come under my notice, which, as applied to teeth, had, I think, hitherto escaped observation. It may, however, be here stated, that the more recent examinations have not led to any modification of the opinions upon the subject of absorption advanced in the paper alluded to, but have served rather to confirm the statement there made. Absorption may commence upon any part of the fangs of a tooth, and at several points at the same time. By the gradual extension of this process, both in depth and superficially, the root of the tooth is wasted, till, at last, nothing is left but the crown, and even this part is often so much hollowed out, that, excepting the enamel, but little of the tooth remains. The *cementum* is first attacked, then the *dentine* disappears, and the enamel at those points where

the *dentine* has been entirely removed suffers from the same action. But whichever of the three tissues is attacked, we see the same characteristic surface as that shown by bone when undergoing a similar action, namely, a surface full of deep indentations, as though they had been made by a sharp piercing instrument, having a semicircular extremity. These minute holes or depressions proceed in various directions, several advancing from contrary points towards the same spot, not unfrequently isolate pieces of *dentine.* If a section be taken through the substance of a tooth, so as to cut the wasting part at a right angle, we shall find the surface acted upon to have an irregular festooned outline, so characteristic, that when once seen it cannot fail to be again recognized.

It has been stated that, closely applied to the surface, a cellular mass will be found, and that this is but slightly adherent, the wasting and growing surfaces readily parting, unless the two are held together by the irregularities on the surface of the former. It will sometimes happen that the cellular mass penetrates into the *dentine* through a small opening, and there dilates, in which case its withdrawal becomes impossible. This condition is now and then found on sections prepared for the microscope, when we have an opportunity of examining the two tissues *in situ.* Indeed we shall find a few cells adherent to the surface of the *dentine* where less deep burrowing has occurred. The cells themselves do not present any peculiarity by which they could be readily recognized, if separated from the part undergoing removal. They are small granular cells, of a more or less spherical form. If a tooth which has lost its fang be carefully removed, we shall find remaining in its place a growing *papilla,* corresponding exactly in size and form to the surface from which it has been separated; and this separation may often be effected with so little injury to the absorbent organ, that no blood appears upon its surface after the operation, although the organ is highly

vascular and readily torn.* The superficial extent of the papilla will be equal to that part of the tooth undergoing waste, but the extent, as regards depth, is slight, for, as the root of the tooth disappears, the socket is contracted by the deposition of bone, which forms at the base of the absorbent organ as rapidly as the cellular surface encroaches upon the tooth. The cases in which we find an exception to this condition are those in which the permanent has advanced close to the fangs of the temporary tooth, when the crypt containing the one communicates with the socket of the other, the rate of growth of the permanent having been greater than the absorption of the deciduous organ; but even in these cases we may generally observe some part in which the contraction of the socket is coincident with the absorption of the occupant fang. From the following quotation, it does not appear that Mr. Bell observed these conditions:—

"It has been already stated, that the permanent teeth during their formation are crowded together in the jaw, by being placed in a smaller arch than they would occupy if regularly placed side by side. As the latter, however, is their destined situation, we find that as soon as they are advanced to a certain point of their formation, and can no longer be contained within the *alveoli*, absorption takes place in the anterior parietes of the cavities, by which means the teeth are allowed to come in some measure forward. In consequence of this absorption it often happens, that not only the socket of the corresponding temporary tooth, but that of the tooth on each side is also opened to the permanent one. Absorption now commences in the root of the temporary tooth, generally on that part nearest its successor, and thus goes on by degrees as the latter advances, until the root is completely removed, the crown at length falls off, leaving room for the permanent tooth to supply its place."

Mr. Bell, however, rejects the idea that mere pressure of the one tooth against the other has any thing to do with the absorption of the first set; an opinion that he would probably have expressed even more strongly, had he observed the shallow but perfect sockets which are formed when the temporary teeth are shed before their successors are ready to appear. This, however, must be a very common

* Laforgue and Bourdet recognized the presence of the absorbent organ, but supposed it exhaled a fluid capable of dissolving the roots of the temporary tooth.

condition, as I have in my own collection several specimens illustrating the point.

The fact was not overlooked, I think, by Hunter, although his description is not very clear. He states at page 99 in his 'Natural History of the Teeth,' "The new *alveoli* rise with the new teeth, and the old *alveoli* decay in proportion as the old teeth decay; and when the first set falls out, the succeeding teeth are so far from having destroyed, by their pressure, the parts against which they might be supposed to push, that they are still inclosed and covered by a complete bony socket. From this we see that the change is not produced by a mechanical pressure, but by a particular process in the animal economy."

But there is still a disposition on the part of many who are intrusted with the treatment of teeth, to attribute the absorption of the roots of the one tooth to pressure occasioned by the growth of its successor, and the development of the permanent may have something to do with the shedding of the other. But this does not offer a satisfactory explanation of all the circumstances attending the absorption of the fangs of teeth. In the first place we sometimes meet with cases in which the fangs of permanent teeth are as completely absorbed as those of the temporary organs. Then, again, the fangs of temporary teeth, which have no successors, are also absorbed. These circumstances, taken with the hitherto overlooked fact, that with the waste of the temporary tooth we have pretty generally a corresponding development of bone within the socket to be removed before the permanent tooth appears through the gum, render the pressure theory somewhat unsatisfactory. Another condition may be adduced, tending also against that opinion, namely, that temporary teeth occasionally maintain their place to the exclusion of the permanent ones, which are then kept within the substance of the jaw, or appear in some unusual position.

The relation as regards time between the absorption and shedding of temporary teeth and the appearance of the suc-

ceeding permanent teeth are by no means constant. In some cases the temporary teeth are thrown off two years before the corresponding permanent ones come through the gums. In others, again, the new will replace the old ones in as many weeks or even days.

Before the laws which regulate the absorption of the fangs of teeth can be fully recognized, a more perfect knowledge of the condition attending the process must be acquired. Recent examinations have enabled me to add the following additional facts bearing upon this subject to those already known. The process of absorption once commenced, it appears to have been assumed that the same action would be continued, with more or less rapidity, until the tooth falls out; or if not continual, is suspended only. Such, however, is not constantly the case. Not only is the action of absorption suspended, but one of development takes its place. We find the excavated surface of the *dentine cementum* and enamel covered with *cementum*, the latter following all the irregularities of the former tissues, and closely united to them. In cases where this development is going on, or being set up is maintained, the teeth afford considerable resistance when their removal is attempted. In those instances where the first teeth have remained, and tend to the displacement of the second set, this deposit of *cementum* will be found to exist in considerable quantity.

The development of bone upon the surface which had formerly been the seat of absorption, by no means indicates that the tooth will not again be subject to destructive action. On the contrary, specimens in my collection show that the bone deposited under the above circumstances may itself become the subject of absorption, that this process may be again suspended and development be renewed, that the absorption may again take the place of development; in fact, that wasting and reparation may alternate until by the preponderance of the former the tooth is shed. In sections of teeth showing this peculiar condition of development, we may find upon the growing bone numerous osteal

cells, with here and there a lacunal cell. A bone *lacuna,* situated within a semicircular indentation in the *dentine,* gives the appearance of a lacunal cell, and a *lacuna* similarly situated in the *cementum* (a circumstance of common occurrence,) has possibly been supposed by Mr. J. Salter to be what has been described in the paper before referred to as a lacunal cell.*

The part of a tooth which has the greatest power of resisting absorption, is that in immediate contact with the pulp. We find examples in which a thin shell of *dentine* surrounds that organ, while that around it has been in great part taken away. This is, however, eventually removed, and the pulp itself changes its character, and becomes an absorbent organ, or makes way for that which is. In a fortunate selection we may find sections showing in one part *dentine* which has been but recently formed, with its modular outline and contiguous cells, capable of developing *dentine;* in another part absorption in active progress; and in a third the deposition of bone on the surface of the wasted *dentine.* In no instance, however, have I seen *dentine* deposited upon the surface of that which has been diminished by absorption.

It would appear that the dentinal pulp, although its function may be changed into that of absorption, or its place be taken by an absorbent organ, and this, again, changed to one for the development of bone, is incapable of resuming under any recognized circumstances its primary function of dentinal development. In other words, that a portion of *dentine* when removed by absorption, cannot be replaced;†

* Transactions of the Pathological Society, vol. vi, p. 169.

† Since the manuscript was sent to the Editors of this Journal, I have seen a paper published in the last number of the Guy's Hospital Reports, by Mr. J. Salter, 'On Intrinsic Calcification of the Permanent Tooth-pulp.' Mr. Salter describes a section taken from a carious temporary molar, which was removed from the mouth of a person aged 18 years. The author states, that the "pulp was found converted into a mass of crusta petrosa and dentine confounded together." The drawing is beautifully executed, and shows, by the usual indications, that the pulp-cavity has been enlarged by absorption of its parietes.

while in bone, or *cementum*, the removal of a lost portion is of frequent occurrence. Sections taken from the teeth of adults seldom fail to exhibit points where the *cementum* has been removed and again added; and very commonly the absorption has at points extended a short distance into the *dentine*, and the lost parts made good with *cementum*. This condition may be observed in perfectly sound teeth; but in unsound ones, where the *cementum* exceeds the normal amount, the removal and renewal of issue is still more marked. If the section be so made as to give a view of the surface of the pulp cavity, we shall probably find evidence of the pulp after the full development of the tooth, having resumed its full formative powers, and produced new, or secondary *dentine*, the action having been excited either by the wearing away of the tooth or by the presence of caries. If the irritation be continued until it extends down the fang as far as its extremity, and signs of inflammation show themselves, the aperture of the fang will become enlarged by absorption, and after awhile the enlargement is continued to a considerable distance up the root of the tooth. The canal may be again contracted, not by the formation of *dentine*, but by the development of *cementum;* and I have seen one or two instances in which the greater part of the pulp cavity in permanent teeth has been lined with *cementum*. This condition of tissues is very common in teeth that have been long the subject of caries, but I believe it is not confined to carious teeth. I have several specimens of temporary teeth, in which the lower part of the root has suffered from absorption, and then has become the seat of deposition of *cementum*, leaving only a small canal in the centre. High up the root small patches of *dentine* have been removed, some of which only have been made good with *cementum*, while the contiguous parts have retained their usual condition.

Judging from a view of the engraving only, it would appear that the tissue in contact with the wasted dentine is cementum only, while the newly-developed dentine is limited to the inner portion of the mass. If this view be correct, the specimen would have served for the illustration of the present paper.

It will be seen that the foregoing facts bear upon the opinions advanced by Mr. De Morgan and myself, in the paper on the structure and development of bone, before cited; that we have indications in teeth, as in bone, of alternations, of removal, and deposition of tissue. In the young subject, the development of bone tissue is in excess of absorption, allowing the bones to increase in size; that in middle life the two powers, under ordinary circumstances, balance each other, and the bones preserve their adult dimensions; while in old age the absorbent action appears to preponderate. Conditions pretty nearly parallel occur in the dental tissues after the temporary tooth has been fully formed; portions of *cementum* are removed, and with it, in some cases, a little *dentine;* the lost parts are replaced by *cementum*, and the tooth is again perfect. When the time approaches for shedding the teeth, the two actions alternate; but the absorption being in excess of the development, the tissues disappear, and the tooth is shed. After the formation of the permanent teeth we have occasional alterations of the two actions; but they are balanced, and neither increase or diminution of size is observed. But as age comes on, it often happens that absorption is in excess, the fangs diminished in size, the teeth become loose, and fall out.

Observations on the Structure of the Enamel.—Without going fully into the structure and development of the enamel, and into the citations of the opinions published upon the subject, I wish to take this opportunity of recording certain observations which I have made upon that structure. The transverse striation of the enamel fibres has been frequently remarked, but the cause of these markings has not been determined. If sections from a number of teeth be examined, it will be found that the striæ are much more strongly pronounced in some specimens than in others, and most especially so in those in which parts of the tissue have a brown color when seen by transmitted light.

The markings crossing the direction of the fibres are of two descriptions. The one arranged in contour lines, and situated at irregular distances from each other, uncertain in number and extent, and sometimes altogether absent. The other kind minute and regular, extending from fibre to fibre, and strongly resembling the transverse markings in voluntary muscle. In the present instance my remarks will be confined to the latter kind of markings.

In unhealthy subjects the permanent teeth, when they appear through the gums, are not unfrequently destitute of the brilliant white color common to the finely-developed organs of a healthy child; on the contrary, they have an opaque yellow color. If such teeth be selected for examination, we shall find that the sections, when reduced sufficiently thin to be seen by transmitted light, present in the enamel a confused opaque appearance; but if a tolerably high power be used (such as the quarter or eighth object-glass) in conjunction with a strong light, the dark appearance will resolve itself into a series of lines; the one set marking the course of the fibres, the other taking the direction of the transverse *striæ.* The two sets of lines crossing each other at right angles leave interspaces approaching a square form. These interspaces are filled with granular masses, having the appearance of cells. By treating the section carefully with dilute hydrochloric acid, these appearances become more distinct, and we then have series of parallel fibres composed of distinct sheaths, each containing a line of granular cells or masses arranged in a single series, presenting a strong resemblance to the ultimate fibrellæ of muscles. That such is the true structure of enamel is, I think, satisfactorily proved by specimens in my collections, some of which show the cells or granular masses; whilst others show the sheath, with the contents removed. Other specimens, again, show the enamel fibres in the very young subject, deprived of their salts, detached from each other, and floating about in the fluid in which the section is preserved.

The fibres illustrating these forms were drawn from specimens which retain the conditions figured. The appearances described do not admit of dispute; but the interpretation of their origin may perhaps be differently given by observers who do not agree upon the manner in which the enamel is developed. I do not propose to enter upon the question of development; but shall for the present leave the subject, after stating the varying conditions of enamel as it is found in human teeth.

In well-formed teeth, although the cell-like markings in the enamel are not by any means as distinct as in teeth in the condition I have described; yet having first examined the latter, but little difficulty will be experienced in recognizing here and there faint indications of a similar structure, especially if the light be well managed. The more perfect the development of the tooth, the more transparent and free from markings will be the enamel, when seen as a microscopic object; and the less perfect the more distinct will be the columns of granular cell-fibres.

Examples may readily be found in which the union between the enamel fibres is so defective that the tissue readily breaks down; a condition rendering it very difficult to grind it sufficiently thin for microscopic examination. When obtained, however, such specimens are very instructive, as they show distinctly the individual fibres and their contents, which in the most highly-developed tissue are so perfectly fused together, that the strongly marked distinction of parts, which is so obvious in the one, is almost entirely lost in the other.

From what has been stated it will be seen that my view of the structure of enamel is as follows:—

The enamel fibres are composed of a sheath containing a series of cells or masses; that in perfectly developed enamel, the cells or masses and sheaths are so blended that but slight distinction of parts remains, but that in less perfectly developed tissue the component parts remain visible.

Observations on the Development of the Enamel.—In the preceding remarks we have referred to the structure of the enamel when fully formed. We now propose to enter upon the manner of the formation.

Mr. Huxley, in an able article published in this Journal, entered very fully into the history of the subject, giving a clear account of the different views which have been promulgated, and citing the authorities for each. Under these circumstances it will not be necessary for me to go over the same ground. I will, therefore, refer the reader to the pages which contain Mr. Huxley's paper, in place of reprinting his historical matter.*

After adopting this arrangement, that part of Mr. Huxley's paper which gives his own views on the development of the enamel, together with that which has been subsequently written upon the same subject, alone remains for consideration.

Prior to the appearance of Mr. Huxley's essay, it was pretty generally believed that the enamel fibres were formed by the direct calcification of the columns of the enamel organ. This opinion has, however, been shaken by a discovery made by that distinguished physiologist. He found that a membrane can be raised from the surface of the enamel, at any period during growth, by the addition of an acid; the membrane being external to the enamel fibres already formed, and internal to the enamel organ—in fact, lying between and separating the two tissues. This membrane Mr. Huxley regards as the *membrana preformativa* of authors. He describes it as perfectly clear and transparent, and as being continued over the dentine in those parts where enamel has not yet been formed, and over the dentinal pulp where dentine has to be developed, giving it in fact the position which the basement membrane of the

* On the Development of the Teeth, and on the Nature and Import of Nasmyth's 'Persistent Capsule;' by Thomas H. Huxley, F.R.S.—'Quarterly Journal of Microscopical Science,' No. III, 1853.

mucous membrane of the mouth would occupy when the tooth-pulp is in the follicular stage, and consequently in the sacular stage, supposing such membrane to exist in the one case, and that it has not disappeared in the other. These points are shown in the figures illustrating Mr. Huxley's paper.

M. Lent, a pupil of Kolliker's, published a paper on the development of the dental tissues, which was subjected to the Professor for revision.* Hence it must be regarded as expressing to some extent the opinions of M. Kolliker as well as those of M. Lent. The account there given of the development of the enamel is in the main but a confirmation of Mr. Huxley's statements, the points of difference being unimportant. M. Lent describes the so-called *membrana preformativa* as structureless, but as it were indented with the ends of the enamel fibres. His figure shows a surface impressed with minute square depressions. Mr. Huxley gives a similar figure. The latter author says: "Neither the capsule nor the enamel organ takes any direct share in the development of the dental tissues, all three of which—viz. enamel, dentine, and cement—are formed beneath the *membrana preformativa*, or basement membrane of the pulp." In another place he says: "Neither the capsule nor the 'enamel organ,' which consist of the epithelium of both the papilla and the capsule, contribute *directly* in any way to the development of the dental tissues, though they may indirectly.

M. Lent believes that the enamel organ exerts some direct influence in the formation of the enamel, and puts forward the following hypothesis, viz. that the cells of the enamel organ secrete a fluid, which passes through the *membrana preformativa* and there forms enamel, and he assumes that the secretions of individual cells are independent, each one forming or corresponding to an enamel fibre.

* 'Ueber die Entwicklung des Zahnbeins und des Schmelzes,' von Eduard Lent, Stud. Med. aus Hamm.' 'Zeitschrift fur Wissenchaftlichs Zoologie Sechster Band,' p. 121, 1855.

I have latterly been occupied with this subject, but have for the most part confined my investigation to young and fœtal teeth of the human subject. I must, therefore, be understood to speak of the enamel of the human teeth.

The method of investigation has been that indicated by Mr. Huxley and M. Lent; and in the pursuit of the subject I have endeavored to trace the development of the tissue without reference to its homological relations, under the belief that the structure and development of a tissue should be perfectly understood before assigning its place among other structures.

The investigations were commenced upon the lower jaw of a nine-months' fœtus, which had been in spirit for some weeks. On placing an incisor under the microscope, the surface was seen to be covered by the enamel organ: the addition of a drop of dilute hydrochloric acid (one part of acid to eleven of water) at once produced the appearance described and figured by Mr. Huxley; that is, a membrane seemed by degrees to swell up from the whole surface of the enamel, the outer surface having adherent to it, by their proximal ends, the columns of the enamel organ. The covering glass was then removed, and the acid taken up with blotting-paper, and dilute spirits of wine substituted. The next step in the investigation was the removal of the membrane raised by the acid, in order to submit it to separate examination. This end was effected by the aid of needles; but in the operation the part became torn in several places, so that its sac-like form was lost. On returning the specimen to the microscope it was seen that the membrane had a strong tendency to roll up in an opposite direction to its normal position on the tooth, the outside thereby becoming the inside of the rolls. This disposition offered facilities for examination: had it been otherwise there would have been some difficulty in obtaining a good view of the torn edge. It will be observed, on examining the figure (which is an accurate representation of a preparation which I have succeeded in preserving,) that we have on the

concave side the columns of the enamel organ, while on the convex side the decalcified enamel fibres remain. I have to discover any thing like a distinct membrane interposed between the two parts. A point may be recognized where the two graduate into each other; but this part cannot be regarded as a membrane, as the forming-enamel fibres clearly pass through it.

The columns of the enamel organ are, however, very readily detached, and many float off in the fluid when the part is under manipulation. If examined in this condition, some are found in parallel bundles, and apparently attached slightly to each other; but many are quite unconnected. But whether associated or single, each column will be found to have a delicate small process projecting from that extremity which was connected with the enamel, a process which would pass through a membrana preformativa, could such be shown to exist. Immediately above the point from which the process starts, the column has, when separated from its fellows, a slight circumferential dilatation, as though the cylinder had been averted at the edge when the separation was effected. A close examination of the columns will, I think, lead to the belief that each is composed of a delicate sheath, in which is inclosed one or more nuclei, the interspaces being occupied by transparent granular matter. The nuclei are usually more distinct near the peripheral end of the columns; the attached extremity being commonly more granular than nucleated; but I have seen cases in which the sheath seemed pretty fully occupied by nuclei. After the preparation had been kept for a few weeks, the nuclei became more faint, and the granular matter more apparent.

Now, supposing the decalcified enamel fibres are detached from the columns and are viewed singly, it will be seen that the end which approached the dentine is clear and transparent, while that which meets the columns is coarse and granular, appearing by transmitted light of a deep-brown color; indeed, but for the color, it would be difficult to

distinguish the distal extremity of the decalcified enamel fibre from the proximal end of the column of the enamel organ.

In many parts of the specimen the columns have been wholly detached, leaving a surface similar to that figured by Mr. Huxley, and described as the membrana preformativa. But if we look directly at the edge of the specimen where it is turned towards the observer, it will be seen that the enamel fibres pass through to the surface of this apparent membrane.

The enamel fibre, in its decalcified state, consists of a fine transparent and structureless sheath in the part which is fully formed, but in the distal portions, where development is progressing, the sheath appears to contain in many instances granular matter.

M. Lent mentions that he had at first some difficulty in obtaining the membrana preformativa, freed from enamel fibres. He at length succeeded, by treating the decalcified specimens with caustic potash or soda. No doubt the extremely delicate sheath of the enamel fibre would under such treatment soon disappear, and he might have got rid of the so-called membrane by a continued application of the same agent, in which case he might as fairly have argued that no soft tissue existed, as he has done in assuming that a distinct membrane bounds the enamel fibres because the sheaths have been dissolved by an alkali, before the partly ossified distal extremities disappeared.*

* The results of the following experiment illustrate the amount of dependence which can be placed upon membranes, the existence of which cannot be demonstrated otherwise than by the use of reagents. A thin longitudinal section was prepared from the upper incisor of a rat. This was placed for a short time in hydrochloric acid and water (one part of acid to eleven parts of water;) on removal, the acid was neutralized by a solution of potash. When placed in the field of the microscope, it was seen that membranes had started up from the whole surface of the preparation. Not only did a membrane part from the surface of the enamel, but one equally distinct peeled up from the worn, masticating surface of the tooth, while others appeared upon the surfaces which were produced in grinding the section. The membranes thus demonstrated were distinct, clear, and transparent, but exhibited no trace of the structural char-

The appearances which I have described, as existing in one specimen, may be found in the teeth of similar age in any fœtus, which has not been too long kept. Immersion in spirits of wine for a short time, I think, favors the demonstration, as the extremely-delicate columns of the enamel organ become hardened, and hence keep their normal position more frequently than in perfectly fresh subjects. Still in the latter similar structural conditions to those I have described may be observed.

If, instead of taking an incisor, the first molar of a nine-months' fœtus be selected, the tooth-sac will be found distended with a fluid, in which numerous nucleated cells float. Generally the cusps of the pulp are covered by caps of dentine, though this is not uniformly the case at this age. In several instances I have preserved specimens, in which one cusp only was invested with dentine, while the others were quite free from calcification. In the latter case the membrana preformativa should be distinctly visible. I have not been able, however, to see any thing that conveys to my mind the idea of a distinct and separable membrane. A slight amount of transparent tissue may be seen extending beyond the peripheral dentinal cells, but it also dips in between them, and has all the appearance of being nothing more than the blastema, which connects into a mass the cells of the pulp. I do not, however, propose to go into the development of dentine in the present article; hence the question of the presence or absence of a preformative membrane extending over the dentinal pulp, and the relations of such membrane to the development of dentine, may be left for future discussion.

If attention be directed to the cusps in which calcification has commenced, appearances similar to those described

acters of the tissues from which they were derived, and of which they had formed a part prior to the application of the reagents In this experiment, the action of the acid was arrested by the potash before the whole of the section had been decalcified. The edges and surfaces were softened, but the interior remained firm and retained its structural characters.

in the incisor will, if similarly treated, be found, excepting only the enamel organ, the columns of which, in this case, are shorter than those in the more advanced tooth.

Although I have confined the description to the structural conditions found in developing teeth in one jaw, my examinations have been extended over the teeth from many fœtal jaws. The results have, however, been uniformly similar.

Assuming that the foregoing observations have been correctly made, we need have no difficulty in explaining the manner in which the enamel is developed, and in accounting for the appearances exhibited in the fully-formed tissue; of which a description and figures were given in the last number of this journal. The columns of the enamel organ must be regarded as subservient to the development of the fibres, the conversion of the one into the other taking place in the following manner:—The proximal end of the column becomes calcified, not uniformly throughout its thickness, but the outer surface or sheath first receives the salts of lime, and at the same time the columns become united laterally. At this point—that is, at the extreme margin of calcification—the columns readily separate from the fibres, and leave a surface which, when looked upon directly, has the appearance of a membrane, the reticulate character of which is due to the withdrawal of the central portion of the calcifying column, this central portion being the process which has been described as forming part of the detached column. The calcification of the central part of the column goes on gradually, but does not keep pace with that of the sheath, and when calcified, presents some points of difference when compared with the surface of fibre. Thus, in adult tissue, the interior of the fibre dissolved before the surface, leaving the reticulated appearance described and figured in the last number of the Journal. Before calcification, the nuclei of the column appear to break up into subgranular matter, which may often be detected at the distal ends of the form-

ing-enamel fibres. The situation usually occupied by well-marked oval nuclei is the distal extremities of the enamel-organ columns; but sometimes we find examples in which the nuclei, or bodies very like them, fill up the whole of the sheath, and become calcified. It may generally be found in the opaque white or brown teeth frequently seen in strumous subjects. A little practice will enable the histologist to recognize teeth which will yield specimens like the one figured.

Many authors have noticed the transverse striation of the enamel fibres. The structural condition I have described is but a more perfect development of that which is but faintly marked in the striation, and a less perfect development of the enamel itself.

In looking over a series of sections of teeth, we shall not fail to find other exceptional conditions than that I have described, and these must be also regarded as the results of imperfect development. I allude to the irregularly-granular state of enamel fibres found in patches scattered here and there amongst highly-developed tissue. At such points the granularity is in many specimens confined to the interior of the fibre, the sheath appearing clear and structureless. Indeed, this deviation from the normal state appears due to the calcification of the columns of the enamel organ, prior to that change by which the granularity disappears, and the fibre becomes transparent.

Mr. Huxley has referred to the "persistent capsule" described by Mr. Nasmyth, and considers it to be identical with the *membrana preformativa.* In several specimens which have been decalcified, after being reduced sufficiently thin for miscroscopic examination, this membrane is obviously continuous with the cementum of the fang, and in other specimens, which have not been treated with acid, I find the membrane thickened in the deep depression of the crown of molar teeth, and there tenanted by a distinct lacuna. The occurrence of these two circumstances would indicate that Nasmyth's membrane is cementum rather than

membrana preformativa. The general absence of lacuna in this membrane is due to its want of sufficient thickness to contain them, just as we find these bodies wanting in the cementum of the fang when the layer of that tissue is very thin.

Apart, however, from this apparently structureless layer described by Mr. Nasmyth, we may sometimes observe a diminution in the fibrous character of the enamel at the terminations of the fibres on the surface of the tooth, and also at the terminal edge of the enamel on the neck of the tooth. In each of these situations appearances may be found which suggest the idea that a fluid blastema became calcified, and that the fibres had in the process become fused, and more or less lost in the mass so formed. Indeed, in the situation last mentioned, lamination of an indistinct character may take the place of fibres; or both the laminated and fibrous arrangement may be replaced by a structure exhibiting little arrangement of parts. In any case, however, this deviation from the normal structural character of the enamel is limited to the terminal edge of the tissue. The development of dentine and cement will form the subject of a future communication.

ARTICLE IX.

Necrosis of Inferior Maxilla from the Vapor of Phosphorus. Removal of the entire Lower Jaw—Recovery—Remarks upon Phosphorus Disease. By JAMES R. WOOD, M. D., Surgeon to Bellevue Hospital, New York, etc., etc. With Illustrations.

Case.—Cornelia S., born in Germany, aged 16; admitted into Bellevue Hospital, December 17, 1855. She came to this country at the age of three months; eight and a half years ago her father died of phthisis; four years ago her mother died of fever. She has enjoyed good health up to the time of her present trouble. Two and a half years ago she commenced to work in a match factory on Second Avenue, in this city, where she remained six or seven months. She then left this factory and entered another on Norfolk street, where ventilation was very imperfect. Her business was "packing," the "dipping" being done in another apartment. She continued at her occupation, working eight hours a day, and feeling perfectly well, until about the 1st of May, 1855. At that time she was seized with toothache, and swelling on the right side of the lower jaw. To relieve it, her gums were lanced, and, finally, the tooth extracted. After this the pain ceased; but the swelling gradually increased, until a spontaneous opening formed on the under side of the jaw, with a discharge of pus, which has continued since. She remained in the factory until one week previous to her admission into the hospital.

Upon examination after her admission, the inferior maxilla was found necrosed on the right side and partially on the left. Her general health was good. Her jaw was painful, and that side of the face swollen. The discharge was at times profuse, and a part of it took place through

the buccal cavity, rendering it very annoying. Her appetite was good, but mastication difficult and painful. She never had had syphilis. The necrosis gradually extended, but her general condition remained good.

On the 19th of January, 1856, thirty-three days after her admission, I proceeded to remove a portion of the necrosed bone upon the right side, intending to leave both the symphysis to which the lingual muscles are attached, and the ramus of the jaw. No anæsthetic was used. The patient was placed on the operating table, with her head and shoulders elevated, and her face turned towards the left side. The external incision commenced midway between the angle and condyle of the right side, and extended along and under the base of the jaw, terminating one quarter of an inch below the symphysis menti. The soft parts were next divided, and the periosteum carefully separated from the bone. A chain saw was then passed under the jaw into the mouth, half an inch to the right of the symphysis, and the bone sawn through. The saw was again passed under the jaw, at its angle, for the purpose of dividing the bone at this point, but, unfortunately, on attempting to work it, the chain broke. I now seized the bone at this point with Liston's forceps, and endeavored to divide it, when it was readily discovered in this attempt that the jaw was necrosed to its articulation. I then endeavored, with the forceps, to remove the jaw entire upon the right side, and succeeded, with considerable effort, in completely enucleating it from its periosteal covering.

But little hœmorrhage occurred, and no vessel required the ligature. The parts were brought in apposition with sutures, and adhesive strips and cold water dressings applied.

January 20.—Pulse, 90; no pain; slept well last night.

January 22.—Wound dressed for the first time; a small part had united by first intention, the remainder in good condition; no pain.

January 26.—Wound entirely healed. An old fistula on the right side, still continues to discharge purulent matter.

While the right side had so greatly improved and apparently left no remnant of the former trouble, the disease was extending upon the left side, involving new portions of the jaw, and giving rise to an immense secretion of intolerably offensive pus. It was, therefore, deemed advisable to attempt the removal of the remaining diseased mass. Accordingly, on the 16th of February, twenty-eight days after the first operation, I removed the remainder of the jaw. The whole of the opposite side I thought dead or dying. At the symphysis it had almost separated itself from the soft tissues, leaving only slight attachments for the lingual muscles. In removing this side of the jaw I designed to leave that part of the symphysis to which these muscles are attached, partly to avoid the liability of the patient's tongue receding into the larynx, but principally to leave an isthmus which should preserve the contour of the chin, and serve as a point of departure for new bone, which would form the periosteum, thus far carefully preserved.

The external incision was similar to that of the opposite side, except that it terminated one-half an inch below and to the left of the symphysis, leaving half an inch of healthy tissue between it and the other cicatrix. The soft parts were next divided, and, with the periosteum was dissected from the bone, both on its external and internal surfaces, as in the previous operation. An assistant now took hold of the symphysis, and a chain saw was passed under the jaw into the mouth, from half to three-fourths of an inch to the left of the symphysis. My object in sawing through the bone to the left of the mesial line, was to prevent the accident previously mentioned; but, unexpectedly, the moment the bone was divided, the central portion left at the chin escaped from its attachments, by simple enucleation, into the hand of the assistant, and the tongue was immediately swallowed. Respiration instantly ceased, and suffocation impended; but, with a pair of strong forceps, the tongue was seized and replaced, and a ligature passed

through it, and secured externally. It was now ascertained that that portion of bone above the angle, was not necrosed, as on the opposite side; but it was decided that the disease could not be arrested, without its entire removal. To complete the operation, the soft parts were separated from the ramus in conjunction with the periosteum, the capsular ligament was opened anteriorly, and a chisel passed over and behind the condyloid process, and by this means the bone was disarticulated. Not a single vessel was tied. The wound was dressed with sutures and adhesive strips. Twenty drops of laudanum were ordered, to procure sleep.

February 17.—Pulse, 112; slept well; wound glued together throughout its whole extent; considerable swelling, but no redness or increase in temperature. Left eyelid œdematous and closed. Wound re-dressed with adhesive strips, and lotio plumbi et opii applied.

Feb. 18.—Face much swollen; some pain over region of the jaw; pulse, 138, and irritable; wound united more firmly, except about half an inch near an old fistulous opening, which discharges pus and saliva. Four ounces of wine ordered to be given during the day—and the lead and opium wash continued.

Feb. 19.—Pulse, 100; pain and swelling greatly diminished. Left eye partially open—continue treatment.

Feb. 20.—Pulse, 98; no pain; some œdema of palpebræ. Eye easily opened; wound united by firm adhesions throughout its whole extent; no fistulous openings on left side of the face. Appetite good; diet consists of soups and farinaceous substances; unable to masticate solid food—continue the lead and opium wash.

Feb. 21.—Swelling of face nearly subsided; eye open; ligature in tongue removed.

Feb. 23.—Swelling entirely subsided. The contour of the face is perfect. All the movements of the tongue, and those pertaining to the jaw, are preserved—such as protrusion of the tongue, lateral motion, deglutition, etc.

From this time until the 4th of March, the patient did well, and every thing seemed to favor a permanent and radical cure. On the 4th, she went out on a visit to her friends. She was thinly clad, and suffered from the cold. The next day, March 5, the left side of her face was swollen, hot and painful. She had some thirst, a light fur on the tongue, and an accelerated pulse—ordered a cathartic, with lead and opium wash.

March 6.—Patient feels much better; all inflammatory symptoms have subsided. Two fistulæ have formed in the track of the cicatrix, which are discharging healthy pus—ordered a light flaxseed poultice.

March 12.—Two small pieces of bone discharged through the fistulous openings.

March 20.—Fistulæ entirely closed.

During the progress of the case no unfavorable symptoms appeared. The incisions healed with remarkable rapidity. The patient had a good appetite during the whole time. The contour of the face is preserved with remarkable accuracy. The cicatrices are entirely concealed from a front view, and all the motions pertaining to the jaw and tongue are unimpaired. New bone began early to form, and small pieces have already separated.

The illustrations exhibit, accurately and beautifully, the appearance of the inferior maxilla, when the different portions of the bone were properly united, and also the amount of deformity which remains after the removal of such an integral portion of the skeleton frame work of the face.

I take this occasion to acknowledge my indebtedness to Dr. Geo. Amerman, house surgeon to Bellevue Hospital, for his attention to my patient, and the foregoing details of the case.

Remarks.—Phosphorus disease, or necrosis from exposure to the fumes of phosphorus in the manufacture of lucifer-matches, was first noticed in Germany. Lorinser, of Vienna, published the first account of this disease in 1845,

and reported a number of cases. Soon after, Heyfelder, of Erlangen, and Strohl, of Strasburg, published cases; and in 1847, Drs. Von Bibra and Geist,* published a separate work. In the following year, accounts of the disease were published in England; and in noticing a case, in the surgical reports of Guy's Hospital (1846–47) of separation and exfoliation of the lower jaw, from exposure to phosphorus, in the manufacture of lucifer-matches it is stated that the disease was previously noticed to be not uncommon in those working in phosphorus. Mr. Stanley alludes to this disease in his Treatise on Diseases of Bones. Cases have been occasionally reported in English periodicals; and in the Lancet for 1850, (vol. i, p. 41,) there is an interesting clinical lecture, by Mr. Simon, on this subject, with the full details of a case. Phosphorus disease does not seem to have been frequently noticed in this country, if we may judge by reported cases; yet the causes exist among us in all their intensity. I am aware, indeed, of but a single case which has been placed on record, and that was observed by Dr. Bigelow, of Boston. That this disease is more prevalent in this country, than might be inferred from this single case, is evident from the several cases appended to this paper, which I have been able to collect, and the case kindly communicated by Dr. Van Buren.

As this affection has not been brought before the American reader in any detail, the following summary of what is known of its nature, progress, and results, may not be inappropriate in this connection:

That phosphorus is the destructive agent in this disease, has been proved by experiments upon animals. Rabbits exposed to the fumes of phosphorus, under circumstances similar to those which determine the disease in man, are

* *The Diseases of the Workmen employed in Lucifer-match Manufactories, and especially the Affection of the Maxillæ, produced by the vapors of Phosphorus, etc.* By F. Ernst Von Bibra, Ph.D., and Lorenz Geist, M.D., Erlangen, 1847. See also *British and Foreign Med. Chir. Review*, 1848, vol. i, p. 446.

similarly affected. Another fact seems clearly established, viz: the vapor of phosphorus must come into immediate contact with the periosteum or bone, in order to excite the morbid process. This explains, in the first place, why but few, comparatively, are affected who work in these manufactories; and, in the second place, why the lower jaw is more frequently the seat of the disease than any other bone. For it appears that those only suffer who have decayed teeth—the defect in the teeth allowing the fumes of phosphorus to penetrate to the periosteum. So important is this latter fact, that the government of Erfurt has passed a decree, that no person having decayed teeth shall be allowed to work in lucifer-match factories. In a factory in this city, no workman is allowed to return to his work for a week, after the extraction of a tooth.

That particular part of the work which gives rise to the greatest quantity of vapor of phosphorus is the most dangerous to operatives. This occurs in the process of preparing the paste, and in dipping. In the first process, a high degree of heat is necessary, and large quantities of the fumes of phosphorus are given off, which fill the rooms. In the second, the paste is spread upon a metal plate, with a temperature sufficiently high to keep it liquid, over which the dipper stands, and necessarily inhales the vapor which arises. Where the ventilation of the establishment is well conducted, the "dipper" is the only operative affected by the phosphorus; but where the ventilation is bad, and the fumes of the phosphorus, disengaged, not only during the process of mixing and dipping, but also in counting and packing, are confined, workmen engaged in other departments are similarly affected. This fact finds striking confirmation in the history of lucifer-match factories of this city. In the old factory in Twelfth-street, the ventilation was poor, and the mixing room was in communication with the work room. As a consequence, whenever the paste was prepared, the whole room became filled with the suffocating vapor of phosphorus. In this establishment, phospho-

rus disease seems to have been not uncommon. In the new factory, the phosphorus room is in a separate building; and so perfect is the ventilation, that there is scarcely a smell of phosphorus in the building. No case has yet occurred in the new factory.

The general effects of phosphorus upon the workmen in these factories, are differently stated by different writers. The German authors do not seem to refer the diseases of operatives to this cause; but, on the contrary, regard the laborers in these establishments, as healthy as those in any other. French writers, however, ascribe to the inhalation of the fumes of phosphorus, certain bronchitic affections under which this class of persons are found to labor. English observers agree with the German, in regarding phosphorus vapor as harmless to the individual; and some even allege that the operatives in these factories, enjoy better health than before entering them. I have not been able to learn that the workmen, in these factories in this city, suffer unusually from bronchitis, or indeed any other affection which could be traceable to phosphorus, except the disease under consideration. Two intelligent medical students from my office, Messrs. Bird and Johnson, have visited the lucifer-match establishments of New York, and have been kindly received by the proprietors, who gave them every opportunity to thoroughly examine the premises. In their report to me, with the appended cases which they were able to collect, the following note is made of the appearances of the operatives :—"They seemed as healthy as those of our cotton factories in Lowell, or our woolen factories in Lawrence, or our flax factories in Andover, Mass."

The peculiar form of disease here considered, is a periostitis. It has been a question,—whether the disease is excited by direct contact of the phosphorus with the periosteum, or whether it does not first enter the blood, contaminate the system, and secondarily induce necrosis. This question would seem to be definitively settled by the following considerations : 1.—Operatives exposed to the fumes

of phosphorus do not suffer from any special or general malady, showing contamination of system, or the existence of a cachexia. 2.—The disease attacks only denuded bones. So well established is the fact, the operative is considered safe until he has carious or extracted teeth.

We consider it established then, that the phosphorus must find access to the periosteum, when the morbid process is set up. It more often affects the maxillary than other bones, for this reason; and the inferior maxilla than the superior. That other bones are equally affected, when the phosphorus vapor reaches the periosteum, is proved by experiments upon animals.

The frequency with which the different bones of the face are affected in this disease, is exhibited by the following collection of cases:—

Whole No.	Max. Sup.	Max. Inf.	Max. Sup. and Inf.
66.	22.	36.	8.

The pain of the jaw, which ushers in the disease, is generally mistaken for toothache. It is usually slight at first, and intermittent, and is due to the slow process of periosteal inflammation which results in the formation of a lamina of bone beneath the periosteum, and around the old bone. This takes place around the base of the jaw, owing to the gravitation of the exudation from the inflamed periosteum. This, the first stage, is chronic and may be indefinitely prolonged, without causing much inconvenience to the patient. The second stage begins with an attack of acute inflammation in the diseased part, excited by cold, or otherwise; there is great pain and swelling of the soft parts; the new formation is destroyed, and discharged, with an abundance of offensive pus; and the old bone remains a sequestrum in the midst of the products of suppuration, to be subsequently discharged in successive portions. This stage is attended with great suffering and constitutional disturbance; and not unfrequently patients die from exhaustion during this process of suppuration, or from gangrene of the soft parts. If the disease pass on unar-

rested, the jaw becomes more and more involved, large portions exfoliate, and the whole finally becomes implicated. Few survive to this period, and a still less number witness the completion of the morbid process, in the discharge of the entire jaw. Mr. Stanley exhibited a patient of St. Bartholomew's Hospital, suffering from this disease, whose entire lower jaw had exfoliated, excepting one condyle.

The prognosis in these cases is very unfavorable. When the disease first comes under notice, the periosteal inflammation has generally long existed, and new formations already separate the bone from its covering. More frequently the suppuration is established, exfoliations of bone are taking place, and the whole morbid process is in active progress. The system now breaks down under the exhausting discharges and poisonous emanations from the jaw; and the miserable subject of this destructive disease falls a victim to its inroads upon his strength, long before the completion of the process of exfoliation.

The regeneration of bone, in cases where extensive necrosis of the jaw occurs, or where it is entirely removed, as in the present instance, is an interesting and practical question. From the investigations of Von Bibra and Geist, we learn that the new deposit derives its nutrition from the periosteum only, and is, therefore, the product of this membrane. Unlike callus, it has no communication of the Haversian canals with the bone upon which it lies, while its medullary canals are vertical to those of the bone. They conclude that the new formation has a lower degree of development than true bone. The following is the average of several analyses of bone and the deposit, made by these authors; and, considering the authority of Von Bibra in the chemical examination of bone, they are worthy of note:—

Bone.			Deposit.		
Organic constituents		31.42	Organic constituents		38.16
Inorganic	"	68.58	Inorganic	"	61.84
		100.00			100.00

The excess of organic matter in the deposit is striking, and it would be interesting to know in what relation this deposit stands to the new bone. Some authors doubt the possibility of new bone being formed in these cases; but the case under consideration proves their reasoning untrue. Although there may not be a complete regeneration of bone, the reproduction has evidently begun, and small portions have already separated. As the periosteum, for the most part, still remains, there seems no reason why new bone should not be formed; unless the peculiarity of the periosteal inflammation excited by the phosphorus prevents it. The fact just stated, that bone, or a substance strikingly resembling it, already exists in the track of the bone removed, refutes the supposition.

The treatment of this affection in the early stage is that adapted to periostitis, and in the later stage, necrosis. Free incisions of the gums, both to relieve the tension which results from inflammation of the periosteum and to procure local depletion, will be required. These incisions should be made wherever there is inflammatory swelling, and freely down to the bone. General antiphlogistic remedies will be useful, according to the condition of the patient. When suppuration is established, tonics should be freely administered, to sustain the general health, and exercise in the open air enjoined; locally, detergents may be used with benefit; such as, gargles containing astringents,—myrrh, or chlorides, as the individual case may demand. These measures, however, are but adjuvants in the process of exfoliation.

In the advanced stages, where necrosis has taken place, and nature is endeavoring to separate the sequestrum, an opposite plan of treatment is indicated. An immense discharge of fetid matter issues from the diseased gums, rendering the patient's life miserable, and disgusting to his attendants; his system gradually gives way, and death almost inevitably closes the scene, unless art comes to the assistance of nature. In this, the last stage of the affec-

tion, surgical interference seems imperatively demanded. I am aware that some surgical authorities advise to leave these cases to nature, and simply sustain the system. But if we had not reason and experience in analogous diseases to guide us in this last extremity, we certainly have in the case already detailed a clinical fact worthy of consideration. The benefit which this patient derived from surgical interference was never surpassed in my experience. The first operation was followed by the most decided improvement of her general condition, and the last has restored her to a comparative health. I should, therefore, always advise to remove the dead bone as early as possible, and thus relieve the system of a source of great irritation, which nature labors long and often ineffectually to accomplish. If this is judiciously effected, and the general health preserved, we may confidently anticipate that by a regeneration of the osseous tissue, not only will the deformity be inconsiderable, but the functions of the inferior maxilla will, to a considerable extent, be preserved.

Case 2.—(Communicated by Dr. Wm. H. Van Buren.)—James O'Donnell, a native of this city, 24 years of age, was admitted to the N. Y. Hospital on the 21st of February, 1856, with necrosis of the left side of the lower jaw, accompanied by very considerable swelling, hard to the touch, and presenting the shape and general physiognomy characteristic of necrosis of the lateral portions of the inferior maxilla. He was able to open his mouth to the extent of half an inch only. Several of the teeth were loose, and pus could be forced by slight pressure from around their sockets.

In regard to his general condition, the patient seemed to be suffering from extreme debility; he could hardly arise from a sitting to a standing position without assistance, and walked with difficulty.

On inquiring into his previous history, it was found that he had been employed in (Hyatt's) a lucifer-match factory, on the corner of Broadway and one of the upper streets,

(36th,) for a number of months—that his health was excellent when he commenced work in this establishment, but had gradually failed; and that six weeks previously, the soreness and swelling had first made their appearance in the jaw. He stated, voluntarily, that several other persons employed in the manufactory were suffering from complaints similar to his. The fetor and difficulty of utterance in this case, together with the low grade of intelligence of the patient, prevented his attendants from getting as thorough a history of his case as they desired.

In view of the recent character of the disease of the jaw, and the bad general condition of the patient, he was ordered cod-liver oil, with iron, and an appropriate mouth-wash; several of the loose teeth were also removed, and a sympathetic abscess, which had formed below the jaw, was opened. Before the limits of the disease could be ascertained, with a view to relief by surgical means, the patient was removed from the hospital, on the 29th of March—the only changes in his condition comprising an improved state of his general health, and local relief, mainly in consequence of a new outlet for the discharge.

Case 3.—Catharine Karker, aged 21, born in Germany; single, poor, and moving in the lower ranks of life. Her occupation is that of filling match-boxes, at which she has been occupied since nine years of age; the disease began in the old factory, which was very badly ventilated. The whole lower jaw is involved. The disease began at the second molar tooth; she had a tooth extracted, and went back to work the same morning. The tooth was but decayed; and she had it extracted because it pained her. There was no disease previous to losing her teeth. She was under treatment by Dr. Ware, who removed pieces of bone several times.

Case 4.—Elizabeth Karker, aged 25, born in Germany; single, sister of the above. She is occupied in filling frames, and has been thus engaged twelve years. The lower jaw is involved; the disease has extended through-

out the whole jaw. She says that the bone was removed to the middle of the chin at one operation. It commenced from having a tooth pulled; the dentist tore up a long strip of flesh, about the length of the index finger, attached to a piece of the bone. She entered the factory the next day; and from this date the disease commenced. A part of the stump is left. She had no disease previous to losing the tooth. She is under the treatment of Dr. Ware. An incision has been made at the articulation in a crucial form; the parts appear much deformed. This patient is now well, and pursues her avocation at the same factory, while her sister is still sick.

Case 5.—Catharine Brivogel, German; poor, single; aged 19 when disease commenced; it lasted for three years. Her occupation was that of dipper, which she followed nineteen months—during all this time her mouth was sore; she left at the end of nineteen months, and returned again in six months; ventilation of the factory was bad; in her case both jaws are involved; about half of left side of upper, and nearly same on lower, of the right side. The disease began in the upper jaw, about the first molar; she removed, herself, about half of the upper jaw, with the floor of the antrum still *in situ*—this piece she still keeps and exhibits; it has one tooth, the last molar, still remaining. She exhibits, also, thirteen teeth which she had extracted, and which were otherwise perfectly sound. The disease commenced from fracture of the jaw, while having a tooth extracted; there was pain in the jaw, but no disease previous to losing her teeth. She has been under the treatment of various physicians, among whom was Dr. Ware. She is now well, and has four teeth in the remaining portion of the lower jaw.

Case 6.—Mrs. Hellman, German; aged 25; when between seventeen and eighteen years of age, the disease commenced, and lasted eighteen months. She was engaged in filling boxes from the time she was a little girl. Her lower jaw was involved upon the left side, from the first canine tooth

to the last molar. The disease began from a fracture of the jaw, while having a tooth extracted—she had it removed because it was crowded; she then caught cold, and inflammation occurred, followed by a discharge of pus. She had no toothache or pain in the jaw. There was no disease previous to having the tooth extracted. She was under the treatment of Dr. Ware, who removed the piece of bone.

These four cases were all from the same factory.

Case 7.—Julia Hatter, aged 20, German; single, poor; occupied as dipper for two years; lower jaw involved; left side first invaded, extending from first canine tooth backward; there is a fistulous opening through the skin, and free suppuration. She had a decayed tooth extracted for toothache; had no disease previous to having tooth drawn. This case is still going on, and is from a different factory.

The following cases are from the same factory as the patient whose case is given at length above:

Case 8.—Charles Jacobs, aged 27, German by birth, unmarried; resident in this country seven years; has been engaged in a lucifer-match factory five and a half years. The particular branch of the business in which he was employed was making the paste, on account of which he was much exposed to the vapor of phosphorus.

His disease commenced, about four years ago, with a simple toothache. This tooth, the last molar but one, was not decayed; but in the attempt to extract it, the crown was broken off. He returned directly to his work, without waiting for the wound to heal. The pain in the jaw did not cease, but gradually increased in severity. Suppuration was soon after established, and small fragments of bone were discharged. Necrosis of a large portion of the left side finally took place, and a considerable part of the jaw, from the symphysis to the articulation, was removed by a physician. Improvement of the general health followed this operation, and the parts cicatrized perfectly. The disease, however, still continued to extend upon the opposite side, involving new portions of the jaw in necrosis.

His general health continued very good; and he was able to pursue his work, with but occasional interruptions.

At the present time, the remainder of the jaw seems to be involved. The discharge of offensive matter is very great; loose sequestra can be felt along the track of the jaw; the patient's general health is failing, and there is evidence that, if the diseased bone is not removed, the case may terminate fatally before exfoliation is complete.

Case 9.—Amelia Miller, aged 21, born in Germany; has resided in this country eight years. She commenced work in the factory two years since, when nineteen years of age, and was then enjoying robust health. She was employed in cutting the matches and filling boxes. The disease commenced with a toothache. She applied to a dentist to have the tooth extracted, and in the attempt the tooth was broken off with a portion of the alveolar process. Her face swelled considerably, but she returned immediately to her work.

From this time, the disease seems to have gradually become developed, the pain grew more severe; suppuration was established, and matter was freely discharged from the gum, by the side of the teeth. Dead bone finally made its appearance in the diseased jaw, and large sequestra were removed from time to time. In this manner, the whole maxillary bone on the right side, extending from the symphysis to the angle, has been removed, and there remains a very firm cicatrix, covering a hard cartilaginous or bony rim, occupying the original position of the bone. All the teeth on the right side of the lower jaw are gone; but all motions of this part are well preserved.

The disease, however, is not arrested; upon the left side it is still extending, and gradually involving the healthy periosteum, and inducing necrosis of the remaining portion of the jaw. Her general health, which improved after the removal of the diseased mass, is now very good, but is, evidently, yielding to the renewed drain upon her system, and

the constant irritation which she suffers. Unless the entire diseased bone be removed, there seems little hope that the disease will be arrested, short of complete destruction of the lower jaw.—*N. Y. Jour. Med.*

ARTICLE X.

Memoir on the Loss of the Teeth. By Rossi, Paris, 1852.

Continued from page 301.

3.—Arrangement of the Teeth.

When the second dentition has not been regular; when a skillful hand has not been called to remedy errors which nature often commits, and which it is always possible to prevent or correct, this irregularity in the arrangement of the teeth may be the origin of their decomposition.

The teeth are often within or without the usual circle, instead of being regularly placed at the side of each other. These haunts for food, resulting from this vicious arrangement, become laboratories in which destructive acids are formed. We will state here briefly that teeth having cavities hollowed out on their approximal surfaces become dangerous neighbors, because they hold destructive agents in contact with the teeth which they touch.

We have nothing further to say about the arrangement of the teeth and of the importance of this predisposing cause; when it favors the sojourn of aliments, it thus becomes a means of destruction. The natural separation of the teeth is a fortunate distribution, because it does not permit the accumulation of alimentary detritus.

4.—Traumatic Lesions.

They may render the destruction of the teeth easier by depriving them of their covering of enamel, and above all by giving them a form which retains aliments. But as this cause is rare, and as moreover it seldom occurs except upon the molars already attacked, although it may not be apparent, we only mention it to render our list complete.

SUMMARY.

We have completed the study of the causes which destroy the teeth. We have made every effort to avoid useless prolixity in the discussion, or in the examination of facts, in order that the mind might embrace, without being distracted, and at a single glance, so to speak, the whole of the theory. We desired above all to be clear and precise. The reader only can decide whether we have succeeded.

We will sum up what precedes, by a few general considerations.

We have just seen that the destruction of the teeth attributed to a pathological cause termed *caries*, is due only, in reality, to a chemical action of the acids which exist in the humors of the subject, which arise from the putrid or acetic fermentation of aliments, or introduced into the mouth already formed.

That the teeth, an epidermic product, are not penetrated by a single vessel, by a single nerve, and cannot modify themselves physiologically in such a manner as to be exposed to a morbid condition.

That persons from a superficial observation have readily been caused to think for a time that the molars, in particular, sometimes decayed from within outward, for nothing exteriorly indicated the presence of even a considerable cavity already existing in the interior.

That, however, a more minute, attentive examination will always discover an opening, a funnel filling the ali-

mentary detritus upon the ivory through the layer of enamel.

That the interdentiary spaces favored the accumulation and sojourn of this detritus.

That it was there in fact that the teeth were usually attacked.

That the form of the teeth, as well as their arrangement, was sometimes a condition of great importance.

That the action of predisposing causes should be regarded as very important in this process of destruction.

That the lymphatic temperament predisposes to their loss, as the ossification of the teeth is less compact and resisting.

That the union of all these causes or the action of a few only, concurred to their disorganization.

There still remains for us to give a reason for certain facts which the pathological theory cannot explain. The study which we have just completed furnishes us the means, and the influence of the *unique cause*, the only one which destroys the teeth, will be more clearly demonstrated from it. We will set forth these facts under the form of propositions which we will discuss one by one.

CONSEQUENT PROPOSITIONS.

I.—The superior incisors decay; the same teeth of the lower jaw remain sound.

II.—The superior central incisors of an arched form often decompose on their external surface.

III.—The superior lateral incisors are sometimes attacked on their internal surface.

IV.—The superior canines resist oftener than the incisors and superior bicuspids.

V.—The superior bicuspids are often destroyed when all the other teeth remain perfectly sound.

VI.—The first molars are oftener destroyed than the other molars, the wisdom tooth excepted.*

* The bicuspids are classed among the molars by our author.—TRANS.

VII.—The molars decompose by their approximal surface, the superiors generally in mature age having remained sound until then.

VIII.—The inferior molars are sometimes destroyed in aged persons by their external surfaces and at the neck.

IX.—The superior wisdom teeth are often decomposed by their external surfaces, the inferiors by their grinding surfaces.

X.—The inferior wisdom tooth is oftener destroyed than the superior.

WE WILL DISCUSS THESE PROPOSITIONS.

I.—The superior incisors decay, the same teeth on the lower jaw remain sound.

The buccal mucus is in constant contact with the superior incisors; the saliva with the inferior incisors. The buccal mucus is acid, very acid under the influence of certain temperaments, of some morbid conditions. The saliva on the contrary is alkaline. Alimentary detritus readily remains in the interstitial spaces of the superior teeth while it is constantly diluted and carried away below and anteriorly, for this is the most dependent part.

The mucus then acts upon the superior, the saliva upon the inferior incisors, the former to destroy, the latter to preserve. Alimentary detritus may exhaust its action on the upper teeth, it has none on the lower, for it cannot sojourn there but a short time, and not long enough to ferment. This is the cause of this exception, apparently so strange.

II.—The central incisors of an arched form often decompose on their labial surfaces near the neck. We have exposed in detail the causes of this decomposition, in treating of the form of the teeth; we refer the reader to it. (See page 79.)

III.—The superior lateral incisors are sometimes attacked on their posterior surfaces. There is often upon this surface, a conical depression or deep crevice in the

enamel. It is an anomalous form frequently met with. As there is in this case no contiguity but only an imperfect contiguity of the enamel, the imbibition of fluids to the dentine is favored by the phenomenon of capillary attraction.

IV.—The superior canines resist better than the incisors or the superior bicuspids.

This is a problem of form. Their approximal surfaces are rounded, in place of being flat, like the incisors and bicuspids, they touch their neighbors only at one point, the sojourn of alimentary detritus in the spaces which separate them is thus rendered more difficult.

V.—The superior bicuspids are often attacked or destroyed when all the other teeth are pefectly intact.

This proposition needs some explanation.

The bicuspids are the first to serve in the trituration of food. They have but one conical fang, whereas the molars have three above and two below. The solidity of these teeth is not very great, not to be compared with the molars.

Teeth have a movement in their sockets, and it is the more marked when they are less firm, less strongly held.

Well, then! It is one of two things; either the bicuspids of the subject have a hard enamel, or the enamel is slightly ossified, friable. If it is hard, they would wear away by rubbing, and a little flat facet will be found at the place of their contact. If it is friable, on the contrary, it would be ground in a measure from the movement in mastication and the point of contact will present a surface of a dull white color at first, if early examined, like the point of a transparent marble that has been forcibly struck. The enamel is here crushed, it has lost its molecular arrangement, its disintegration intensifies the energy of the acids which act upon it. Now alimentary detritus begins its work with the aid of the buccal mucus, which is in much greater quantity when the approximal surfaces of these

teeth are flat in their whole extent, large and separated only above near the gum.

VI.—The first molars are oftener destroyed than the others, the wisdom tooth excepted.

The first molars are formed about the third year, and are erupted about the sixth. At the epoch of their formation the child is more lymphatic than in after years. The teeth too are not so well ossified, they are softer than those which form subsequently. Lastly, their grinding surface presents a vast number of furrows and eminences and the numerous funnels formed by these multiplied folds retain the alimentary detritus. They absorb readily and by such a number of points that it is not uncommon to see the grinder's surface blackened, and almost entire surface at once a prey to chemical destruction.

VII.—The molars (especially the superior) until now sound, often decompose by their approximal surface in mature age.

Projections of the gum, festoons occupy these interdentiary spaces. These festoons disappear at the time when the gums begin to recede and lay bare the teeth; their place is then occupied by aliments which remain there, ferment and decompose the approximal surfaces. These teeth are flat, very large, deprived of enamel above, near the neck where the ivory of the fangs is already exposed. Destruction may make great inroads before it is suspected and the individual complain of acute pain when the eye and the probe cannot yet fix the cause.

VIII.—The inferior molars are sometimes destroyed in old age by the external surface and near the neck.

This decomposition occurring in old persons is a singular form which has for a long time occupied our attention because it escaped a satisfactory explanation. This decomposition of the external surface near the neck is frequently met with on the inferior molars. They are excavated in such a manner that the crown is often nearly detached from

the fangs, and the havoc seems to be arrested at the line where the enamel terminates whilst it keeps advancing in depth. The tooth appears as if sawn by a very thick saw.

What was the cause of this phenomenon? Why did chemical agents act here in so exceptional a manner? What were they? Questions often revolved in our mind and never solved. Finally we were put on the right path, and under these circumstances:

An old man whom we had known for many years, who had had excellent teeth all his life, a few years since lost an inferior molar every six months from the effect of this strange decomposition.

On questioning him about his health, on the medicaments he had employed which might occasion it, we learned that he was subject to a catarrhal affection of the throat of very frequent occurrence, that he made an almost habitual use of sweetened drinks. The sugar was a sufficient cause up to a certain point, but why did it destroy in preference the lower molars on the external surface near the neck?

We discovered after much questioning, gropingly directed and by one of those accidents of conversation which sometimes casts a ray of light, that he ordinarily kept a bit of lichen or other pastes in his mouth in order to diminish the cough he is afflicted with.

There was now no longer any doubt; he allowed these sugared and mucilaginous pastes to remain and melt slowly between the cheek and the neck of the inferior molars; their action was expended there and these teeth covered by solid enamel which had persisted until then, endowed with a resisting, well ossified tissue, only allowed themselves to be destroyed below the enamel, about the neck where the ivory was bare as is the case when the gums have receded.

Enlightened by this observation, we had the greatest desire, as one might readily imagine, to confirm it by other instances whenever an opportunity might offer. We now

feel sure that the explanation of the fact being due to the presence of sugar, in all the so-called pectoral pastes, is perfectly correct. Our brethren who have frequent occasion to observe this can verify its truth.

IX.—The superior wisdom teeth are often attacked by their external surface, the inferior often by their grinding surface.

The superior wisdom teeth are often erupted with an inclination outwards toward the cheek. In this position their external surface often becomes nearly superior. The cheek rubs against the external border, causing aliments to accumulate upon this surface above the border, and it thus resembles, on account of its obliquity, the bottom ofany vessel. You can predict the consequences of such a disposition.

As to the inferior molars, they remain a long time beneath the gum, but only partially covered. Substances pass under this sort of cap, and when the grinding surface is fairly unmasked, it appears brown, infiltrated, decomposed; sometimes the tooth is nearly destroyed. It is one of the grossest errors to suppose that it was attacked before eruption, that is to say, before it had pierced the gum at any point whatsoever. Such an occurrence never takes place, for the simple reason that it is impossible.

X.—The inferior wisdom teeth decompose oftener than the superior.

The difficulty which these teeth experience in eruption, the length of time occupied in accomplishing it, the almost insurmountable obstacle which the ramus of the inferior maxilla opposes to them, retains them in a large number of cases, several months, several years in the worst physical conditions. During this period folds of inflamed gum surround them and form a kind of pit above their grinding surface which alone is visible; alimentary detritus can lodge there without the point of the tongue being able to dislodge it.

The superior wisdom tooth, on the contrary, advances more rapidly, and does not encounter any of these obstacles, any of these delays, and is less exposed to destruction than the inferior.

The applications of the theory which we have exposed can be multiplied; but the true cause of the decomposition of the teeth once known, it is easy for every intelligent man to explain the thousand and one modes in which this cause acts. Based upon it, every fact explains itself clearly and naturally. We therefore stop here, feeling assured that we have done enough by indicating the path.

CONCLUSION.

The destruction of the teeth being due to chemical agents, as we have already shown, there are many ways of opposing these agents. 1. By preventing their formation. 2. By the administration of substances which neutralize them. 3. By placing the parts most liable to decompose in a more favorable condition.

The formation of the most active acids is prevented by not allowing the alimentary detritus to sojourn and ferment, by discontinuing the habitual use of aliments, drinks, or particular condiments which give origin to them.

Many substances retard, arrest putrid fermentation: others, alkaline, neutralize the action of the acids. Such may enter into the preparation of daily use, selecting them with care according to the subject and his particular condition. It is sometimes useful to employ them as a gargle, as a topical application, &c.

Various operations are also of great service, some are indispensable, before the employment of any other means. They should always be performed by a skillful hand, for any portion of the tooth once taken away is never reproduced, and time cannot restore the blunders committed by an unskillful practitioner.

But we propose as the subject of a second memoir, the examination and criticism of all the proper means for the

preservation of the teeth and arresting their destruction. The absolute theory we have put forth as an exact expression of the truth, throws, you perceive, on all practical questions a new light, and ought to modify the means employed, the operations practiced up to the present time. There are some of them so unreasonable, so wanting in judgment, that we shall abandon them. We will submit something new to the intelligence of our worthy colleagues. We do not wish to be understood, however, to say that all which skillful practitioners have done and still do, is condemnable and injurious; this is far from our thoughts. Still, we avow that it must be very difficult for those who live in complete ignorance of the cause which destroys the teeth, to do just what is required, only what is required, and all as it should be done.

This important question with the development it admits of. But it was indispensable in the first place, and above all, to establish this truth, by which we will terminate, a truth, the results of which are so vast. The *destruction of the teeth is owing to a* CHEMICAL cause, *and not due to a* PATHOLOGICAL *cause, to a disease termed* CARIES.

Science and art properly directed, offer numerous and efficacious resources to prevent, combat and arrest this destruction in its march.

This last proposition will be, we repeat, the subject of a second memoir.—*N. Y. Dent. Rec.*

QUARTERLY SUMMARY.

DENTAL SCIENCE.

1.—*Osseous Union of Teeth.*—Mr. John J. Patrick, dentist, in the Dental News Letter for April, 1856, gives from De Loude, the particulars of a case described by M. Jasinski, in which a well developed molar tooth, with three roots, was taken from the recto-vaginal septum.*

Mr. Patrick then proceeds to state the case of a Mr. Watson, aged 50 years, who called at his office on the 27th of December, 1855, and presented his mouth for examination, calling special attention to a "twin tooth" in his lower jaw. Mr. Patrick continues to say, "upon a clear examination I found the left permanent inferior frontal and lateral incisors perfectly united from the neck up to the cutting edges. I passed a crown lance across the anterior surface of the teeth, in order to discover, if possible, a separation in the crowns, but they remained perfectly firm; the two teeth presented a plain uninterrupted enameled surface, but somewhat shorter than the adjoining teeth."†

The author of the foregoing concludes, from the circumstances connected with the development of the teeth, that such osseous union is more likely to occur in the permanent than in the temporary teeth. Observation, however, has demonstrated the converse of this opinion. Twenty examples of osseous union of the temporary to one of the permanent teeth have been met with.

2.—*Dentistry in Germany.*—Dr. F. Coas, dentist, now practicing his profession in Germany, writes to the Dental News Letter the condition of dentists and dentistry there. He presents a picture which is truly woeful—he says the file is used to a great extent, even

* Several examples of occurrences of this kind are furnished by the annals of medicine.—Eds.

† Two cases similar to the one here described are given by the Senior Editor in his "Principles and Practice of Dental Surgery," with the exception that one occurred between two central incisors in the upper jaw.—Eds.

so much as filing of one-third of a tooth away, in order to preserve the remaining two-thirds. And the filed surface being seldom polished, soon becomes blackened, which renders it still more unsightly. He remarks that filling is termed "*plumbing*," which operation is usually performed with some one of the mineral succedanea—and that he has seen whole rows of front teeth filled in this way—"presenting all the intermediate colors between chalk and charcoal."

The gold which is prepared in Germany being of such inferior quality, that he found some difficulty in making a crown filling with it. He states that a dentist takes rank with barbers and cutters of corns.

Charges for professional services of the dentist, he quotes thus: Extracting a tooth twenty kreutzers, (about 14 cents,) for "*plumbing*," from one to two florins, (40 to 80 cents,) cleaning is one and a half florins. He also says that the laws of the country forbid all foreigners from participation in trade, and mentions an instance of an unlucky wight of an Englisman who was thrown in jail for attempting to practice dentistry without permission of the authorities.

3.—*Working of Steel.*—There is published in the April No. of the Dental News Letter, a paper read by Dr. How, on this important subject. He very justly holds that every dentist should be well acquainted with the properties of steel, and the manner of working it into the several forms which are desired; and expresses some indignation that this subject should not have met with more consideration by dental writers. After which he numbers the different kinds of steel, and decides that cast steel is the best for the use of the dentist, and gives the manner in which it should be worked, so as to attain that degree of hardness most desirable.

He remarks, "that files are cut with chisel-shaped tools, struck by the hammer—and that a skillful workman will make files of different grades with the same tool. The quality of the file is graduated by the thickness, bevel and direction of the chisel, together with the weight of the blow. Experiment must teach, remarks Dr. How, the proper combination of the circumstances for the production of the required instrument."

He then proceeds to state the manner of hardening and tempering, for a cooling medium, water at ordinary temperature is best. Various mixtures are used in the manufacture of different articles.

Oil, tallow and rosin, alone or in combination, are used for articles which require a low temper; brine, mercury, acidulated and ice-water, give a greater degree of hardness than plain water, but for ordinary purposes water fulfills every necessary indication. The instrument to be hardened should be heated *slowly* and *uniformly* to a cherry-red color, and then plunged instantly into the water—if a large object, plunge vertically, and move it about in the vessel.

"Have the water close at hand, in order that no heat shall be lost during the transfer. The scale should always be removed before heating or hardening, and in the case of serrated instruments like files, the small points must be protected from oxydation, by previously coating them with yeast, thick paste, borax, or any thing which will prevent exposure to the air. Sharp angles in large objects render them liable to fracture in hardening, but in very small instruments this is not of much consequence. After hardening, brighten the surface, preparatory to drawing the temper; to do this, many ways are proposed. A simple method for small objects, is to reduce the size of the lamp-flame, by pressing in the wick, or otherwise, and hold the instrument over the flame, beginning at the base of the shank, and revolving it slowly, until the desired temper is obtained. Holding between hot pincers, resting on a bar of hot iron, plunging in a bath of fusible metal, heated to the proper temperature, and various modes of procedure, are open to choice. The object in all cases being to obtain such control over the process as shall enable the workman to fix the temper at any desired point. The steel should be rubbed quite bright, if it has not been protected during hardening, before drawing the temper, in order that the changes produced may be readily and with certainty observed; and these are marked by variations in its color, occasioned by oxydation of the surface, and the sequence is as followa: 'Straw color, yellow, dark-yellow, copper color, purple, blue, whitish-blue.' "*

4.—*Local Anæsthesia by Congelation.*—Dr. H. L. Burpee, in the April No. of the Dental Recorder, thinks that direct application of cold causes too much pain to a vital tooth or one in an inflamed condition, to be adopted into general use. He states that he has

* Elliot on Operative and Mechanical Dentistry.

adopted into his practice an apparatus with which he extracts teeth without pain, but that it requires a longer time to effect the object than the one invented by Dr. Branch, "by commencing with warm water, and graduating the cold at will, by which process the patient suffers actually nothing in the application, and seldom any pain is felt in removing the tooth." The time required is from one and a half to two and a half minutes. "This apparatus consists of a combination force pump, by which two fluids (warm and cold) can be thrown together or separately, through a flexible tube, into a mouth-piece, covering the tooth and surrounding the gum (the muscles of the face and tongue being protected by a non-conductor,) and passing off through a flexible tube leading to a vessel placed in a convenient position to receive the waste fluid." Dr. Burpee thinks that there are cases where different applications of cold may be used, to those teeth or roots which have lost their vitality. He remarks, that the danger to be incurred in anæsthesia by congelation, is as nothing compared to ether and chloroform, and that the results are quite as satisfactory, "and that it leaves none of the ill effects;" "that the patient is relieved from much dreaded pain and anxiety of mind."

CHEMISTRY.

5.—*On the Decomposition of Iodide of Starch by the Animal Fluids.*—Dr. Dalton contributes the following paper to the *American Journal of Medical Science.*

Some months since, while experimenting on the digestion of starch, and its conversion into sugar in the intestine, I observed that the iodide of starch became very rapidly decolorized on being digested, at the temperature of 100° F., with the intestinal fluids taken from the duodenum of a recently killed dog. It appeared, also that this effect was produced some time before any sugar had made its appearance in the mixture, and would even take place, with nearly equal promptness, at the ordinary temperature of the air. It seemed, at first, probable, that the decolorization was owing to a partial alteration of the starch, which passed into an intermediate condition, before undergoing its final conversion into sugar. Subsequent examination, however, showed that it was due to a simple decomposition of the iodide of starch by the organic substances

of the intestinal fluids. Nearly all the animal fluids, indeed, when in a fresh condition, not only discolorize, more or less promptly, the blue iodide of starch, but prevent entirely the usual reaction between starch and iodine when this latter substance is present in small quantity. When the iodine of starch, ready formed, comes in contact with these fluids, the iodine leaves the starch and combines with the organic matters; and it is under the form of such an organic combination that the iodine is absorbed from the intestine, passes through the circulation, and is discharged by the urine. The precaution, therefore, which is sometimes inculcated, in the administration of free iodine, to give the medicine in the interval between two meals, lest it should combine with the starchy matters of the food, and become insoluble and inert, is altogether superfluous; since starch cannot retain the iodine in combination with it, in presence of the digestive fluids.

The iodide of starch, in the form of a paste, has, indeed, been occasionally recommended as one mode of administering the drug; but I am not aware that the mode in which iodine, in this state of combination, becomes absorbed, has yet been directly investigated.

The solution of starch employed in the following experiments, was made by boiling five grains of starch in the ounce of water, and allowing the fluid to cool. The experiments were all made at the ordinary temperature of the atmosphere.

1. If ʒ i of *saliva* be mixed with ʒ i of iodine water, and ʒ ss of the starch solution added, no blue color is produced; but a drop or two of nitric acid immediately turns the mixture blue and opaque.

ʒ i of iodine water is added to ʒ i of the starch solution, making an opaque blue fluid; ʒ ii of saliva are then added, and the whole shaken up. The mixture becomes nearly colorless at the end of five minutes. The blue color is then restored by a drop or two of nitric acid.

2. If ʒ i of iodine water, with ʒ i of starch, be mixed with an equal quantity of fresh *pancreatic juice* (from the dog,) the blue color is entirely dissipated in less than one minute.

3. Light yellow, nearly clear *bile*, from the dog's gall-bladder, destroys immediately the blue color of an equal quantity of starch and iodine water. On the addition of nitric acid, the blue color is restored, modified somewhat by the green tinge which the bile takes with nitric acid.

4. A healthy dog, kept for 24 hours without food, was killed by

section of medulla, and the scanty, light yellowish, frothy *fluid of the small intestine* collected. It discolorized immediately the blue iodide of starch, made in the above manner, and the blue color was restored by nitric acid.

A dog was kept for 24 hours without food, then fed with fresh lean meat, and killed half an hour after feeding. The intestinal fluids from the upper half of the small intestine acted on the iodide of starch in the same manner as in the last experiment.

5. If ʒ ij of the clear yellowish *serum of the blood* (horse's blood) be added to ʒ ij of iodide of starch, the mixture loses its blue color immediately. It is brought back by nitric acid.

6. If ʒ i of healthy human *urine* be added to ʒ i of iodide of starch, the mixture is decolorized in five seconds. The blue color is restored by nitric acid.

The above effect is produced whether the urine be acid or slightly alkaline in reaction.

ʒ i of urine mixed with ʒ v of iodine water effectually prevents the reaction between the iodine and starch.

7. The *gastric juice* acts differently, in this respect, according to circumstances. If taken from the stomach of the fasting animal (by irritation, through a gastric fistula, with a metallic catheter,) it is clear and colorless, and does not interfere at all with the reaction of starch and iodine. But that which is collected during the first half hour after feeding the animal on cooked meat, and which is slightly yellowish in color, and contains a little albuminose in solution, interferes with the reaction very perfectly. ʒ i of such gastric juice decolorizes an equal quantity of iodide of starch in less than a minute.

A specimen of such gastric juice, however, containing a little albuminose, which had been kept for some months, was found to have lost almost entirely its power of preventing the union between starch aud iodine.

If the colorless gastric juice, taken from the fasting animal, which has no effect on the iodide of starch, be digested for an hour at the temperature of 100° F., with finely cut boiled meat, and then filtered, the filtered fluid interferes with the reaction of iodine and starch, like the other animal fluids.

The iodine, in these cases, probably combines, as already intimated, directly with the organic (albuminoid) matters of the animal fluids, and is detected by starch only after these organic matters

have been destroyed by nitric acid. It is not, however, easy to demonstrate this. If the serum of the blood, for example, be boiled with an excess of sulphate of soda, by which all of the albumen, and most of the other organic substances are coagulated, the clear filtered fluid interferes with the reaction of starch and iodine as before. It might be supposed that the iodine, on the contrary, was converted into an iodide of potassium or sodium, under the influence of the alkaline carbonates, and that it passed, under this form, through the circulation and into the excretions. Several circumstances, however, are opposed to this view. First, the iodide of starch is decomposed, not only by the saliva, serum of the blood, and pancreatic juice, which are alkaline; but also, quite as promptly, by the urine and gastric juice, which are acid in reaction. Secondly, the gastric juice, as already mentioned, has no power of preventing the union of starch and iodine, when taken fresh from the stomach of the fasting animal, but yet gains this power in a high degree when artificially digested with meat at 100° F. It seems nearly certain, therefore, that the iodine combines, in this instance, with some of the albuminoid matters dissolved by the gastric juice.

This reaction of iodine with the animal substances is further illustrated, in a very striking manner, by the following experiments, performed at the suggestion and with the assistance of my friend, Dr. Wm. H. Ellett:

I. If a mixed solution of boiled starch and iodide of potassium be spread upon the surface of the skin, and the two poles of a galvanic battery applied to the moistened surface a short distance from each other, no perceptible discoloration appears, provided the galvanic current be not very powerful; while if the same poles be applied to a piece of bibulous paper, moistened with the same solution, the blue iodide of starch appears at once at the positive pole.

II. If the negative pole of the battery be placed in contact with the bibulous paper, moistened as above, the positive pole taken in the left hand, and the circuit completed by touching the bibulous paper with the right forefinger, the shock is felt, but no discoloration of the paper is produced; but if the circuit be completed by a steel needle, held in the right hand, a dark stain immediately appears on the paper.

III. The negative pole was placed in contact with the moistened paper, and a fresh piece of animal membrane (uterus of the cow) attached by one end to the positive pole. The other end of the

animal membrane was then cut to a fine point, by which the circuit was completed on the paper; but no stain occurred. A steel needle was then thrust through the animal membrane, and the circuit completed by the point of the needle, when the discoloration of the paper immediately appeared.

It appears, then, that whenever iodine is set free from its combination with potassium, in presence of starch and an animal organic substance, either living or recently dead, it combines with the organic substance in preference to uniting with the starch.

The influence of the animal fluids in preventing the mutual reaction of iodine and starch is, as might be expected, not unlimited, but depends on the relative quantities of the iodine and the organic substance with which it combines. If there be but little iodine present, it is all taken up by the organic substance, and shows no reaction with starch; while, if present in large quantity, it attacks the starch also, and produces the characteristic blue color. Thus, one drachm of iodine water, mixed with one drachm of gastric juice holding albuminose in solution, has no reaction on starch; but a mixture of two drachms of the former to one drachm of the latter, strikes with starch a perceptible blue color. A single drop of the alcoholic tincture of iodine, mixed with one drachm of gastric juice, is sufficient to produce a blue color with one drop of the starch solution. Other animal fluids, however, appropriate larger quantities of free iodine. Two drops of tincture of iodine, for example, are completely saturated by one drachm of healthy urine, so that the mixture gives no reaction with starch; three drops give only a purplish color, while four drops strike a deep blue color on the addition of starch.

With the adoption of proper precautions, the reactions described above will not expose us to any serious error when endeavoring to ascertain the presence of either starch or iodine in the animal fluids. In testing for iodine, we have only to add a little nitric acid after dropping in the starch; and in testing for starch, we should be sure to add iodine enough to more than saturate the albuminoid substances present. It is at least evident, however, from the foregoing facts, that iodine cannot possibly exist in a free state in the animal fluids, but is always in either a metallic or an organic combination.

6.—*Physiology of the Spinal Cord.*—The prize of experimental physiology, for the year 1855, has been awarded by the French

Academy of Sciences to M. Brown-Sequard. This award was unanimously recommended by the distinguished committee, consisting of MM. Flourens, Serres, Rayer, Magendie, and Cl. Bernard, to which the memoir of M. Brown-Séquard was referred. The following report, drawn up M. Cl. Bernard, gives the fullest account we have met with of the results of M. Brown-Séquard's researches:

It was suspected, at a very early period, by physiologists and physicians, that the different vital phenomena due to the nervous system, and especially, those of sensibility and motion, had distinct organs for their transmission. It is to modern physiology, which has carried so far experimental analysis into the functions of the nerves, that the credit is due of having made the important discovery, and established, by incontrovertible evidence, that the anterior roots of the spinal marrow are the motor nerves, and the posterior roots the nerves of sensation. Or, in other words, that when a voluntary movement takes place, in one of the limbs for example, the motive influence originating in the encephalic centre of the spinal marrow can be transmitted to the proper muscles only by the anterior spinal roots; and that when a sensitive impression is conveyed in the opposite direction, from the periphery of the body to the nervous centres, this can be transmitted to the spinal marrow, and from thence to the encephalon, only by the posterior spinal roots.

While all physiologists are now agreed as to the manner in which the motive and sensitive functions are localized in respect to the spinal nerves, it is not so as to the spinal marrow itself. Are sensation and movement propagated within the spinal marrow by distinct portions of the cord? And if so, which are the portions which transmit the motive influence and which the sensitive impressions? The solution of these important questions has been attempted by the most skillful experimenters, but they still remain undecided. On the one hand, it is contended that the white matter of the cord is unadapted to transmit either sensation or motion, and that the gray matter is alone endowed with this double function, or partakes of it with the white portion. On the other hand, it is maintained that the white matter of the cord is the sole conducting medium, it being supposed, as an established fact, that the posterior fasciculi, which are in connection with the posterior spinal roots, are the exclusive conductors of sensitive impressions, while the antero-lateral fasciculi which are contiguous to the anterior spinal roots are the organs

for the transmission of motion. And it may be remarked, this last opinion is that which has been most generally adopted, at least in France.

M. Brown-Séquard has recently examined anew this difficult question of the transmission of sensitive impressions and motion in the spinal marrow, and the better to limit his subject, he has divided the problem into two; occupying himself, at first, with the determination of the parts of the cord by which sensitive impressions are transmitted from the posterior roots to the encephalic centre. It is, therefore, exclusively to the transmission of sensitive impressions in the spinal marrow that the present researches of M. Brown-Séquard, as well as the experiments performed by that learned physiologist before the commission are confined.

The first proposition that he would establish, is that the posterior fasciculi of the spinal marrow are not, as has been asserted, the exclusive agents for the transmission of sensitive impressions. To prove this, M. Brown-Séquard has performed two leading experiments.

The first experiment consists in cutting through, in a living animal, the posterior fasciculi of the spinal marrow on a level with the dorsal region. When, after this division, we pinch the posterior limbs of the animal, it feels it perfectly, and manifests immediately by its cries the pain it experiences. This result shows evidently that the posterior fasciculi of the cord are not exclusively charged with the transmission of sensibility, inasmuch as the sensitive or painful impression excited in the posterior limbs is transmitted to the brain, after the complete division of the fasciculi above the origin of the nerves of the posterior limbs, and consequently, at a point between the nerve, the pinching of which has caused the sensation of pain, and the brain where that sensation arrives to be appreciated.

Another most interesting phenomenon which has been discovered by M. Brown-Séquard, is that if, in this experiment, we pinch or irritate the posterior fasciculi of the cord at the part where they have been divided, we not only perceive that the two divided surfaces of the fasciculi are sensible, but we usually observe that the inferior or caudal end is more sensible than the superior or cephalic end, which alone remains in direct continuity with the encephalon.

It is unnecessary to remark that this new fact is, also, in opposition to the theory of the exclusive transmission of sensibility by the posterior fasciculi. According to this theory, the same effect

should occur after the division of the posterior fasciculi, as after the section of the posterior spinal roots—namely, the end which remains in direct continuity with the encephalic centre should alone remain sensible, while the peripheral end should become completely insensible.

The second experiment of M. Brown-Séquard is in some degree the counter proof of the first.

We have just seen that the posterior fasciculi of the cord have been divided, in order to show that, without their intervention, sensitive impressions may be transmitted to the brain by other portions of the spinal marrow that remain intact. It can still further be shown, that by the posterior fasciculi alone, when the other portions of the spinal marrow have been divided, the transmission of sensitive impressions cannot take place. This experiment has been performed by M. Brown-Séquard. He divided, upon a living animal, on a level with nearly the second dorsal vertebra, all the spinal marrow, with the exception of the posterior fasciculi. Immediately after this division was made, the posterior limbs of the animal became completely paralyzed, and when they were pinched no sensation was excited; that is to say, the transmission of sensitive impressions did not take place, notwithstanding the posterior fasciculi remained intact.

These two experiments, therefore, logically enchain themselves to prove that the posterior fasciculi are not the organs by which sensitive impressions are transmitted in the spinal marrow. The experiments were repeated before the commission by M. Brown-Séquard, with great skill, upon animals in which the spinal cord was not exposed but for a very limited extent, and so as not to cause debility from hemorrhage, and to obtain the most conclusive results.

M. Brown-Séquard in his memoir examines afterwards the rôle of the gray substance, as well as the anterior and lateral cords of the spinal marrow, relative to the transmission of sensitive impressions. He has performed a number of experiments, in which he has treated the anterior and lateral cords in the same manner as he had the posterior cords, and has arrived at precisely analogous results. M. Brown-Séquard has seen, in effect, that after the section of the posterior cords, of the lateral cords, and of the anterior cords of the spinal marrow, sensitive impressions can yet be experienced, while, when the gray matter is destroyed, the transmission of sensitive im-

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pressions immediately ceases, even when the greater portion of the medullary fasciculi is allowed to remain as much as possible undisturbed. By all these numerous researches, M. Brown-Séquard has been led to the conclusion, that no portion of the white matter of the spinal marrow possesses the function of transmitting sensitive impressions to the centre of perception, but that this transition is effected by the gray medullary matter, especially in central portion. These results are of great interest in the physiology of the nervous centres, inasmuch as they show that insensible parts, as the gray matter of the spinal cord, are able to transmit sensitive impressions, while parts endowed with great sensibility, as the posterior fasciculi of the cord, do not transmit them.

In the second part of his memoir, M. Brown-Séquard has endeavored to determine, experimentally, how the sensitive fibres of the posterior spinal roots, which convey sensitive impressions from the periphery, penetrate the spinal marrow in order to reach the gray matter. Supporting himself, on the one hand, upon the microscopic anatomy of the cord, and, on the other hand, upon ingeniously devised physiological experiments, he has been led to the enunciation of new views, in respect to the manner in which sensations are propagated to the central gray matter of the spinal marrow—which views he has detailed in his memoir, and which prove that this phenomenon is more complicated than we should be disposed to consider it on first view.

To conclude, the experiments of M. Brown-Séquard have thrown light upon one of the most important and difficult questions connected with the physiology of the spinal marrow—that relative to the transmission of sensitive impression by this portion of the cerebro-spinal axis. If some facts in relation to the subject were already known, M. Brown-Séquard has added to these many additional ones. He has varied his experiments, and has so arranged the results of these as to resolve, in a very satisfactory manner, the question which was the subject of his researches. The commission have consequently unanimously awarded to him the prize for experimental physiology, for the year 1855.—*Moniteur des Hôpitaux,* Feb. 5, 1856.

EDITORIAL DEPARTMENT.

BIBLIOGRAPHICAL.

The Louisville Review, a bi-monthly Journal of Practical Medicine and Surgery. Edited by S. D. Gross, M. D., and T. G. Richardson, M. D.

This is a new candidate for the favor of the medical profession, and judging by the present number, likely to be successful. The names alone of the editors are sufficient to ensure for it a respectful and cordial reception. We notice particularly a biography of the late Dr. Daniel Drake, by Dr. Yandell, and a sketch of the eminent German surgeon, Richter, and his cotemporaries, by Dr. Gross. In the course of this article, Dr. G. undertakes the defence of Benjamin Bell, against whom every student of medicine has been prejudiced by the dashing philippics of that brilliant but eccentric genius John Bell. Dr. Gross is very severe upon John, whom, with all his talents, he regards as little better than a charlatan.

History of the Ligature applied to the Brachio-cepholic Artery; with Statistics of the Operation. By Paul F. Eve, M. D., Nashville. 1856.

In this paper, read before the Tennessee State Medical Society, Dr. Eve has given the statistics of sixteen attempts to tie the *arteria innominata.* In only thirteen was the ligature actually applied and these were all fatal. It is but justice to say that this is the largest number of these operations ever collected in one list, Erichsen enumerating only nine and Velpeau ten. Dr. Eve attributes the ill success of the operation to the impossibility of obliterating the subclavian. He is decidedly opposed to attempting to tie this great trunk.

The American Journal of Science and Arts, for July.

Contents: Notice of microscopic forms found in the sea of Kamschatka, with a plate, by Prof. J. W. Bailey; examination of two sugars from California, by S. W. Johnson; composition of muscles in the animal system, by Valenciennes & Fremy; review of the classification of crustacea, by J. D. Dana; on the mode of testing building materials, by Professor Henry; iron ores in the Azoic system, by J. D. Whitney; obituary of Prof. Zadoc Thompson; influence of solar radiation on the vital powers of plants, by J. H. Gladstone; reports of explorations and survey for Pacific railroad; five new mineral species, by Prof. Charles U. Shepherd; correspondence of M. Jerome Nicklés; Scientific Intelligence.

The Mutual Responsibilities of Physicians and the Communiiy. By Henry P. Tappau, D. D., LL. D.

Dr. Tappan is chancellor of the University of Michigan, and delivered this address as a valedictory to the last graduating class. It is chiefly a defence of medical schools in general and of the University of Michigan in particular. There is of course the usual glorification of doctors common on such occasions, the only times at which the hard-worked practitioner sees much in his fate wherein to glory.

MISCELLANEOUS NOTICES.

American Dental Convention.—It will be seen from the following communication, that the second meeting of the above named society will be held on Wednesday, Aug. 6th, in the city of New York. We have reason to believe, from the notices we have seen in several of the Dental Journals, and from what we have heard from various members of the profession, that the meeting will be well attended.

We have on numerous former occasions, dwelt at considerable length upon the benefits which may be derived from free intercommunication between the members of the dental profession, and from associated effort for the advancement of science. Therefore, we do not deem it necessary to say more at the present time than merely to call the attention of our readers to the subject. We trust that the deliberations of the convention will be characterized by a spirit of harmony.—Eds.

Philadelphia, May 15, 1856.

Dear Sir—Through the medium of the Dental Journals you have, no doubt, become aware that the "American Dental Convention" assembled, organized, and held its first session in the city of Philadelphia, August 2d, 1855.

In forming this Association, its members were animated by the desire to establish a Society upon a basis broad enough to obtain the united support of the entire profession; and that its platform should be such as to secure to each and every dental practitioner, not only in the United States but the entire world, an opportunity for a liberal expression of views upon the various topics connected with the principles and practice of the profession.

By referring to the report of the proceedings, you will find that throughout the entire session the most perfect unanimity of feeling prevailed, and that the various subjects broached, elicited a free and spontaneous expression of opinion from those present.

The second meeting of the "Convention," will be held in the city of New York, Wednesday, August 6th, 1856. At this, by the desire of the Association, you are respectfully and earnestly invited to be present.

Trusting that you will give the movement your cordial support, I remain,

Yours, respectfully,

J. H. McQuillen, *Cor. Secy.*

Western Dental Society.—It will be seen from the following notice sent to the senior editor, that the dentists of the far west, have organized themselves into a society for the advancement of science and the elevation of the dignity of their profession. We wish them abundant success.

St. Louis, June, 1856.

Dear Sir: An adjourned meeting of the Western Dental Society, is to be held in the city of Chicago, commencing on Wednesday, July 30th, at 10 o'clock, A. M.

The object of the meeting is to continue the work which had so favorable a beginning at the meeting held in this city in April last, by extending the membership and operations of the society over that portion of the west which has not been hitherto embraced in any similar organization.

The invitation is intended to be general, and it is hoped that no one will feel himself neglected in case he does not receive a copy of this circular; but that each and all will interest themselves in the movement, and give it their hearty co-operation and support.

The place of meeting can be ascertained by inquiry at any of the principal hotels in Chicago.

Very respectfully, yours,

C. W. Spalding, *Cor. Sec'y.*

California Medical Society.—We have received by mail a copy of the constitution and by-laws of the Medical Society of the State of California.

Among the names of officers and members, we recognize many with whom we were formerly acquainted. Among that number we notice the name of Dr. B. B. Brown, formerly a practitioner of dentistry in St. Louis. We congratulate the officers and members of the Medical Society of the State of California upon the formation of their association.

India Rubber Base for Artificial Teeth.—In a previous number of the Journal we took occasion to notice the application of vulcanized india rubber as a base for artificial teeth. A few weeks since we received the following communication from Dr. Mallet, dentist, of Hartford, Conn., giving the result of a series of experiments in the use of this article, which cannot fail to be interesting to our readers; therefore, rather than permit the communication to lay over until our next issue, we introduce it into the editorial department of the present number—the portion assigned to original communications having been closed previously to the receipt of the article.—Eds.

India Rubber Teeth.—By Dr. Samuel Mallet, dentist.—Some fugitive notices have from time to time appeared in the public prints regarding the use of hard rubber for dental purposes, but I believe no one has described anything of a practical nature, respecting this article for the purpose named. The idea has been in many minds, that it would be accomplished, but *how* the thing could be done, has been the question.

The first piece of work of the kind, which in any manner resembled a set of teeth, was an upper set; plate, teeth and gums, all of hard rubber,

and in one piece, being made by Mr. F. A. Bevins, in the employ of Mr. Goodyear, by moulding an artificial set of teeth in plaster of paris, and filling the whole with sheet rubber, prepared for such purposes. This was then subjected to the influence of steam, and in the process of vulcanizing, a kind of fusion of the rubber took place, which caused every portion of the mould to be filled, making an exact copy of the case of teeth which was used. But notwithstanding the adaptation to the mouth was most perfect, it would not answer for practical purposes, the color would condemn it, and besides, the teeth were not sufficiently dense to endure the friction caused by mastication. But subsequent experiments warrant a hope this difficulty will yet be overcome.

About this time, Mr. Goodyear, now in France, sent to this country a partial set of teeth, the plate, gums and clasps being composed of rubber, in connection with plain mineral teeth, inserted in the rubber, somewhat like gutta percha work.

About this time, with the aid of Mr. Bevins, an experienced workman in rubber, I made a case of teeth in the same manner. But we were satisfied that this mode of doing the work would not go into very general use, unless the color of the gum could be made more closely to resemble nature, it being about that of mahogany. Many experiments were made to improve the color of the rubber, but they were unsuccessful in bringing it to a life resemblance. We then hit upon a plan of using single gum teeth, and soon a denture was produced which has been worn since that time with much satisfaction.

The durability of the work has surprised me; although the ordinary teeth were used with no attachments but such as were made by the pins and the angles of the teeth, yet I do not see, that they are more liable to loosen from the case than they are when made in the ordinary way of inserting them on gold plate, this is more than I at first expected of the work. The rubber has peculiar qualities. It has wonderful tenacity, when it is under the action of steam, it expands and seeks vent, forcing itself between the particles lying on the surface of the object with which it comes in contact. To show the strength of it I will name, that I took the incisor teeth of a case between my thumb and fingers and attempted to break them from their beds, (these were gum teeth,) but could not without breaking the plate in another place first. I am now using block teeth for this purpose, and I am satisfied that with the plan of making them which I have designed for this work, they will possess a degree of beauty and strength, which cannot be excelled. The work is performed in the following manner: A plate is fitted to the mouth in the ordinary way, and if it is desirable to avoid swaging, gutta percha may be used for the purpose of fitting. The antagonizing model having been taken and the teeth fitted as for other work; with the plate and teeth, by the means of wax, a perfect model is made, in outline of what it is desired the case should be when completed. It is important that this should be exact. A wax rim is made, enclosing

the edges of the teeth or blocks on the labial and lingual sides to represent the band and backings of the teeth.

The model is now to be moulded, the mould being made in sections, so as to fit together very accurately; the teeth are then removed from the model and placed in their respective sockets in the moulds, the rubber being placed in the mould in sufficient quantity to fill it when vulcanised.

The mould being securely enveloped, it is submitted to the process of vulcanising by confining it in a steam chamber for several hours; this done the work is ready to be removed from the mould and polished.

Teeth should be made expressly for this work. There is no difficulty in making single teeth or blocks, which shall be as strong as desirable. I have the block made with two or more excavations about one-eighth of an inch deep on the lingual side, with projections, and in these excavations are pins sufficiently long to allow them to be bent into any desirable shape. The block is also made thicker on this side than for ordinary work, tapered to nearly an edge which is beveled, so that an arch is formed conforming in this particular to nature. In the ends of the blocks where they join together, large corresponding holes are made, into which the rubber flows, making connecting pins of great strength; the rubber also flows around the edges of the blocks, forming the rim on the labial and lingual sides and filling the notches even with the block, so that when the case is finished, there is a uniform surface of rubber and porcelain, differing in appearance only in color, in other respects the blocks do not differ from those which are ordinarily made.

There is a marked difference between the adaptation of metal and hard rubber for plates, and that very much in favor of the latter article. There seems to be more congeniality between the animal system and rubber than is found between it and the various metals used in dentistry. The slight elasticity which it possesses is very agreeable, so different from the rigidity of metallic plates, that it cannot fail to be popular.

Adjustable Punch.—I have an instrument for punching the holes in the backings of teeth, which is adjusted by the pins of the tooth, for which we wish to punch. One punch is movable, and with the tooth it can be set in an instant, so that the holes punched will exactly correspond to the pins in the tooth, this is an instrument of which every dentist has felt the need. I showed it last November to Dr. Clark, of New Orleans, Drs. C. C. Allen, and John Allen and A. Jones, Esq., of New York, who all approved of it much, and some of them remarked that "it was one of the most complete things, for a small one, which they had seen for a great while." There have been unforeseen reasons why it has not been made known and prepared for the use of the profession.

Mr. Chevalier, of New York, has it now in hand, and will soon be ready to fill orders. A full description of the instrument, accompanied with an engraving, will be furnished for the Dental Journal. S. Mallet.

Osseous Union of Teeth.—We have frequently had occasion to notice examples of osseous union of temporary teeth, very many having fallen under our own immedieate observation, but with the permanent teeth occurrences of this kind are altogether less frequent. Indeed, until recently, we never saw but two cases of the kind. These are noticed in "Principles and Practice of Dental Surgery." But within the last few weeks, we have received from Dr. S. Mallet, dentist, of New Haven, Ct., an upper central and lateral incisor belonging to second dentition, perfectly united from their cutting edges to within nearly an eighth of an inch of the extremity of their roots.

Soon after the receipt of the above described specimen, we received the following note from Dr. Goodwin, of North Carolina, enclosing another very interesting example of osseous union of a lower permanent lateral and supernumerary tooth.—Sen. Ed.

Elizabeth City, N. C., Nov. 8th, 1855.

Dr. C. A. Harris: *Dear Sir*—The enclosed specimen of osseous union between the fangs of a right lateral incisor, and a *supernumerary lateral incisor,* which I recently extracted from the mouth of a patient, seems to me to possess some claims to be considered a novel "freak of nature," as it seems to combine two departures from established law in the same case. Viewing the specimen as rare as curious, I am induced to forward it to you; believing that your interest in whatever concerns the profession, will impart to this little curiosity a value, that will entitle it to be classed among the many singular phenomena, that are constantly presenting themselves to our notice. The *double* deviation which is here found, has suggested the idea of presenting the specimen to you, being the first that I have ever encountered in my practice, though with others it may be of frequent occurrence. Hoping that you may find something of interest in the specimen, I remain yours,

Very respectfully, J. B. Godwin.

Supenumerary Teeth.—The senior editor begs to acknowledge the receipt of four supernumerary teeth, two from Dr. Bessent, of Concord, N. C., and two from Dr. Thompson, of Providence, R. I. The first two were extracted from behind and between the upper central incisors; the other two were taken from between the first and second upper molars—one from each side.

Introductory Lecture.—We are indebted to J. C. Clendon, M. R. C. S., dentist, for a very interesting and able introductory lecture, which he delivered at the commencement of his last course at the Westminster Hospital, London, on the diseases of the teeth. We would be glad to make some extracts from it, but are prevented by want of room.

Omitted.—Although the present No. of the Journal does not fall short of the usual limits, it was nearly filled before the editors were aware of the fact, consequently they are compelled to omit several editorial articles designed for the present issue.

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ORIGINAL COMMUNICATIONS.

ARTICLE I.

Diseases of the Maxillary Sinus. By Dr. J. A. Giraldes, Professor agrégé à la Faculté de Medecine, &c. &c., Paris. Translated by Dr. Christoper Johnston, Baltimore.

(Continued from page 417.)

Section IV.—*Modification in Nutrition with formation of new products.*

Solid Tumors.—The question that we are about to treat, one of the most important of our subject, one of the most curious of pathology in general, is also one of those to which the least attention has been directed; wherefore it is not surprising that we should find much confusion in regard to this matter in works which comprehend it in their scope. In fact, the diseases under consideration have always been confounded together under the generic name of tumors, and consequently *clinicians* have ranged the most dissimilar things in the same category: under the capitulation of fungus, cancerous tumors, they have grouped entirely different products and diseases, unlike in their anatomi-

cal constitution, and, what is worse, in the various consequences to which they give rise. This point of our subject must be studied anew, and the study cannot be prosecuted simply with the united observations in the annals of the art, but we must add to them a clinical analysis carefully aided by microscopic observation and the other means which science now employs. In a clinical point of view this study is of the first importance, for it only can enlighten the practitioner as to the gravity of the affection and the consequences which may ensue; it alone may justify great operations, which are the honor of surgery when they are conceived and done under suitable conditions: and, on the other hand, may it authorize the complete rejection, in certain cases, of the intervention of operative medicine.

The tumors met with in the antrum of Highmore, and which most frequently invade the tissues of the face, may be classified, as well as all morbid productions, under two distinct heads: the first comprising tumors having some analogy with the normal tissues, and the second including tissues of abnormal constitution not otherwise discovered in the organism. In the first category are placed *fibrous, cartilaginous, osseous tumors,* as well as *enchondromata* and *erectile* and *epithelial tumors.* In the second are grouped *fibro-plastic tumors* and those of *cancerous nature.**

§ 1. *Tumors formed of tissues having their analogue in the economy.*—The tumors forming this division are: 1st, Fibrous, fibro-cartilaginous, fibro-cystic, enchondromatous, osseous, erectile, epithelial and fatty.

Before going farther in this study it must be stated that these productions are frequently developed in the sinus itself, and that, at times, they originate not only in the sinus, but also in

* The translator begs leave to say, that this division of the subject, for which Lebert was originally responsible, is inexact in so far as concerns the *epithelial,* the *cancerous* and the *fibro-plastic* elements. The last named are admitted by C. Robin, (Tableaux d'Anatomie, &c.) and Lebert to be normal constituents and pathologically *homœomorphous*—and Müller and Velpeau, having long denied the existence of a *specific microscopic element of cancer,* and the truth of observation having forced M. Robin to a confession of their faith, the microscope appears to be no longer diagnostical of cancer and of epithelioma; and if any differences exist they must be established upon other grounds than the *dicta* of that instrument.

the surrounding parts, from which they sometimes take new elements, and add them to their own. Thus, in certain cases, the periosteum of the bones of the face, and other tissues, become unusually vascular, the periosteum is the seat of ossification and contributes to solder to neighboring parts the tumor originally developed in the maxillary sinus, and to form a mass which it is oftentimes difficult to trace to its initial point; thus Peele relates an example of an osseous tumor occupying the antrum of Highmore developing itself towards the anterior part of the face, extending itself into the cranium, but of which it is impossible to understand the origin; it is of the same class as those described by Howship;* as those of which Bordenave has given a description;† of these enormous exostoses found in the Dupuytren museum, and of another identical production of the same kind in the Hunterian museum, labelled 3236.

If tumors developed in the sinus can be confounded with the other morbid productions of the bone of the face so far as to render the precise distinction of their origin doubtful, it would be those formed without the maxillary sinus surrounding or depressing its cavity. Stanley‡ cites the case and gives the drawing of a tumor developed in the gums, which established itself in the cavity of the sinus by forcing before it and surrounding the osseous laminæ. Lyne§ relates an instance of a very curiously developed tumor penetrating into the sinus in the same manner. Thus this distinction of tumors developed in the sinus or penetrating into its cavity is not a division purely theoretical, it will add very great interest to their clinical study.

Fibrous Tumors.—Tumors of a fibrous nature are to be found within the maxillary sinus. Lisars,|| Warren,¶ Burgrave,** Lupuytren,†† Knor‡‡ and Lubourg§§ have given cases. The anatomical constitution of these tumors has not been studied

* Ostiosarcour ejusque Specici ensequis descriptio. Wirceb, 1819.

† Practical Obs. on Sur. and Mort. Anatomy.

‡ On Diseases of the Bones; illustrat. pl. 16.

§ London and Ed. Monthly Journal, 1843, June, page 1.

|| Practical Surg. ¶ Surgical Obs. on Tumors. Boston, 1848, p. 480

** Gaz. des Hos., 1849, p. 61. †† Lecons Clin., vol. 3.

‡‡ Soc. cit. §§ Bull, de la Soc. Anat., 1828.

with care; as far as we have observed, authors who have had occasion to examine these tumors have confined themselves to a mere account of their nature, saying only that they were formed of a white and reticulated fibrous tissue, &c. Tumors of this kind seem, according to O'Shaughnessy,* quoted by Stanley, to be common in the Indies, and in this country they grow to a considerable size. This author gives an example of a tumor of the maxillary sinus weighing four ounces. He adds, they are more frequently observed among the young Indians.

Fibrous tumors of the maxillary sinus are met with in persons of all ages; the causes which determine their formation are but little known. In some cases, observation by M. Bergrave, the origin of the disease is attributed to a contusion; but this etiology is far from being demonstrated, and knowing that blood poured out at one time does not undergo the same change that it does at another, the coincidence of a contusion with the production of one of these tumors is of but little importance in explaining its development. Fibrous tumors of the maxillary sinus attain to a very great size; during their development they distend the walls of this cavity, and, like the productions of another species, they attack and surround the adjoining parts, and are confounded with them. Sometimes, however, they penetrate the sinus at a fixed point. Thus, Warren gives a case of an individual, aged fifty-one years, in whom a tumor of this kind had extended to the lower eyelid, protruding exteriorly and forming a bulbous mass, believed to be a fibrous tumor of the eye lid. The tumor having been removed, it was seen to have grown from the antrum and protruded through an opening of this cavity. Trennery has seen a case in which the fibrous mass invaded the entire face.† Tumors of this kind sometimes present osseous spicula; Leiton gives an example.

Fibro-Cartilaginous Tumors.—As the tumors previously described, those of a fibro-cartilaginous nature have been supposed, from an inspection with the naked eye, to present this structure,

* Vide Lancet, 1850, p. 574. † Medic. Chir., trans., t. xx.

and even at the present day, no other distinction has been demonstrated. Lisars, Liston and Gensoul, give examples of such tumors. Morbid growths of this kind are ordinarily of a rounded form; the name is at once suggested by their texture. Some, for example, as those of which Liston speaks, are formed of white fibrous matter mixed with gelatinous substance, coagulable by heat and enclosed in cells. In one case, the treatment of which I had charge in the hospital of la Pitié, in 1847, the tumor presented a white rounded mass, having the aspect of cartilage and formed of cells similar to those in the honey-comb, filled with gelatinous matter.

Fibro-cartilaginous tumors sometimes attain to a very large size. In the case described by Gensoul, the tumor was seven inches in diameter.

Fibro-cystic Tumors.—In some cases of fibrous tumors of this cavity, cysts are found in their substance. Cruveilhier,* examined, after death, the case of a woman aged sixty-eight years, in the maxillary sinus of whom there existed a voluminous fibrous tumor filled with hollow cysts.

Enchondroms.—I have never met with a case of enchondromatous tumors of the maxillary sinus, but think it likely that some morbid growths described under the name of fibro-cartilaginous tumors might belong to this class. This supposition is rendered probable as enchondroms are not of rare occurrence and have been frequently confounded with cartilaginous exostoses. Besides, tumors of this kind have only been studied since the publication of the work of J. Müller, and particularly since the patient labors of M. Luckett. This able and learned anatomist has examined the structure of enchondroms with much care, and has added his researches to the catalogue of microscopic preparations of the Hunterian Museum.

Progress and Diagnosis.—The tumors now under consideration are usually of rapid growth and have a tendency to invade the surrounding parts. Before bursting the walls of the cavity in which they are situated, they extend in every direction; they

* Essays upon Ant. and Path., vol. 1, p. 393.

also tend during their evolution to shrink and destroy the cavity formed in the maxillary bone. It is thus that the floor of the orbit is elevated and the eye forced out of its cavity; that the nasal cavity is filled and obliterated by the development of the morbid mass; that the vault of the palate is depressed, forming a round tumor; that the depressions of the canine fossæ enlarge and disappear, and that the dental arch becomes embedded in the side of the tumor. But these modifications are not always observed in the periphery. Whilst this is going on the bone becomes thin, and when pressed feels like rumpled parchment.

It is easily understood that a growth of this nature, obliterating and destroying the cavity connected with such important nerves, could not exist without being accompanied with sympathetic phenomena, such as sharp and intense pain of the face and side of the head. It is also observed that vision is perverted or completely destroyed; the sense of hearing is sometimes impaired by the compression of the eustachian tube or by some other cause. These tumors have a tendency to affect the surrounding tissues, causing increased vascularity, thickening and inflammation of the mucous membrane—having sometimes upon their surface bloody fungi, which are often attended with serious consequences. The skin of the face itself does not always escape these changes; it becomes vascular, the veins dilate, assuming a varicose condition.

Prognosis.—The prognose of these tumors is directly connected with the precise knowledge of their nature and of their histological composition. Those designated by the name of fibrous, fibro-cartilaginous, &c., when they are really formed by elements which seem to indicate their character should not be considered as serious. In fact they are removed without any serious consequences to the patient, and he recovers without the slightest constitutional impairment. What is most satisfactory and important to know is, that these tumors are never reproduced.

Osseous Tumors.—Osseous tumors of the maxillary sinus have been observed by David, Hundertmack, Otto, Georgi and M. Lenoir, &c. Tumors of this description belong to two dis-

tinct classes. Some are found in the sinus itself: M. Michou has met with a very remarkable example which he presented to the Chirurgical Society. Others occupy at the same time the cavity and surrounding osseous tissues, as has been shown by David, Buttner, M. A. Pettit, Warren, M. M. Huguier and Hancock.

Tumors of this kind are almost always accompanied during the progress of their development with deposits of osseous matter in the periosteum and in the maxillary bone. There is developed in the facial bones a true osteosis—a bony envelop enclosing a new production—an *osteide.* It constitutes an almost stony mass, recalling the form of the osteide in the ear of cetaceans. These masses are of an ivory whiteness; they have a fluted form, sometimes with a series of globules united between them, a very compact and hard texture and are very heavy. Their microscopic texture is similar to that of bony tissue. A piece of this kind which I have before me, and for which I am indebted to Dr. Follin, found in the sinus of a horse, shows the periosteum to be covered with osseous productions of new formation resembling needle-like crystals, amongst which are dispersed particles analogous to manna in flakes.

The second kind of osseous tumors occupy both the sinus and the maxillary bone. Ruttner gives an example of a case of this description. South notices a case, the preparation of which is in St. Thomas' Hospital, and Hancock describes a bony tumor weighing seven ounces, occupying the upper jaw and antrum. This second description of tumor belongs to the class of spongy exostosis. The structure is alveolar and easily penetrated by a cutting instrument, the meshes are filled with a reddish substance slightly analogous to spongy bone. M. A. Pettit, Gensoul, Warren, M. M. Huguier and Lenoir, notice tumors belonging to this class. They invade the face as well as the maxillary sinus; they sometimes attain to a considerable size, as the observations of Bordenave and Hundertmack show. They constantly augment and develop themselves either from the side of the orbit, nasal fossæ or alveolar arch, which, by the compression they exert upon the neighboring parts, are often productive of serious consequences, as is shown by the case quoted by David.

The causes concerned in the production of these tumors are not well understood. It is probable they sometimes owe their origin to a syphilitic vice. Bayer mentions a case of a large exostosis occupying the jaw and extending to the side of the orbit, having all the characteristics of the morbid growths now under consideration, and which disappeared under the influence of anti-syphilitic remedies.

Prognosis.—From the tendency to enlarge and develop themselves in the cavities and to interrupt the functions of the mouth, nose and eyes, their prognosis is unfavorable.

Erectile Tumors.—Erectile tumors of the maxillary sinus are very rare. We do not remember to have met with a case, but believe the one described by Gensoul as a varicose tumor may be classed under this head. There is another description of tumor of this cavity, which Pattison thinks is of the nature of those now under consideration. It is described in the American edition of Burns' Surgical Anatomy. In this case the carotid artery was tied and the patient recovered. As these tumors are of rare occurrence, and as but few autopsies have been made, we must be cautious in admitting the existence of erectile tumors in this cavity. The remarks of Delpch would seem to render such caution necessary. This surgeon met with a tumor of the maxillary sinus in a man fifty years of age, presenting all the characteristics of an erectile tumor. Pulsation, susurrus, shrinking of the tumor by compression of the carotids; in fine, a series of symptoms appearing sufficient to determine its erectile character. The patient died, and the autopsy showed the tumor to be of any other nature than erectile.

Fatty Tumors.—This description of tumors is not described by authors as occurring in the maxillary sinus. Stanley speaks of them, but does not give a description; he only states in a note that they are formed of globules of stearine. Tumors of this kind must be very rare, as we have no other mention of them.

M. Viard presented to the Anatomical Society a case of fatty tumor of the maxillary sinus, of which the following is the description: "The superior maxillary of the right side exhibits an en-

largement of the size of a turkey's egg, and the bone is diseased throughout the whole extent, yielding easily to pressure. A fatty mass has almost entirely taken the place of the bone. It completely fills the cavity of the maxillary sinus, but the disease does not seem to have originated in this cavity, for in the substance of the tumor there are bony laminæ intersected and separated one from another by adipose tissue." (15 *Mai.* 1850. *Bul. Soc. Nat.*)

SECTION II.—*Tumors formed of a Normal Tissue—Heterologous Tumors.*—This class of tumors includes those most frequently met with in the maxillary sinus; they also attack the greater portion of the maxillary bone, and are usually preceded by a pathological condition of the sinus. We find in the study of these tumors the same confusion that attends the study of those belonging to the first category; thus, under the name of encephaloid and cancerous, we confound tumors of various nature and of different degrees of malignancy. Fibro-plastic, epithelial, and encephaloid tumors are all confounded under the vague denomination of cancer of the jaw.

In this category of tumors we should establish two distinct classes. In the one fibro-plastic, and the other encephaloidal tumors. I will not attempt to describe the microscopical elements peculiar to each of these classes. I can only say that clinical observation seems to justify the division I have established; the first or fibro-plastic tumors are seldom liable to be reproduced in any form, whilst the second, encephaloidal, have a fatal tendency to return after their removal. It only remains to examine the degree of frequency of each, as well as the period of life in which they are most frequently developed, but this branch of pathological inquiry has not been very thoroughly investigated.

We establish two classes of heterologous tumors: first, fibro-plastic, second, encephaloidal, but will not give a separate description. Heterologous tumors occur at every age, from the earliest to the most advanced. Warren mentions a case which occurred in a child of ten years. M. Maisonneuve has removed them from patients of sixty-nine years of age. Fla-

jani and Gensoul have also operated upon patients of sixty years of age. Stanley also speaks of a growth in the sinus of a child aged four years. Thus the two most opposite periods of life seem to be equally subject to this affection ; hence we have reason to presume it may occur at the earliest period of infancy; for encephaloid cancers attack other parts of the body, and develop themselves with the most fearful rapidity.

The distinction we have established between the two classes has been confirmed by experience. A girl, aged fourteen, laboring under a disease of the maxillary sinus, was placed under the care of M. Guersant. The tumor, after having filled the sinus, developed itself in the nasal fossæ. The young patient was operated upon, the sinus being exposed externally, and the tumor was seized and plucked out. The microscopical examination, made by M. Broca, whose authority in this matter cannot be doubted, showed that it was formed of elements belonging to fibro-plastic tumors.

Causes.—The origin of these tumors cannot be ascribed to any precise cause. Dessault, Brutalour, Gensoul, &c., have observed these tumors developing themselves as a consequence of contusion of the face. A patient of Liston's affected with a tumor of this kind, had suffered from a carious tooth. If we compare these facts with those connected with the ordinary development of cancerous diseases, the agency of them would seem to be rendered doubtful.

Mode of Development.—We do not know whether these productions are developed most frequently in the periosteum or the mucous membrane. We are even ignorant whether the disease originates at the surface of the latter or cellular tissue of the former. Walshe inclines to the opinion that it has its origin in the mucous membrane, owing to the fact that he has seen similar productions which were developed from this tissue, designated by the name cauliflower. But whatever may be the point in the sinus from which it emanates, the morbid mass remains a long time without making any sensible progress, and is only manifested exteriorly by some functional modifications which it is presumptuous to regard as of a cancerous nature,

and is most frequently accompanied by deep-seated pains of a neuralgic character. The disease often remains thus concealed for a long time in the depths of the sinus, and it is only where some mechanical injury has been inflicted that the disease becomes aggravated, increasing in malignancy, and being attended with pain of a severer and sharper kind, which the patient compares to a sensation of fullness or distension. Liston gives a case in which these symptoms were experienced. Blandin and Dupuytren give a case in which the development of the tumor was accompanied with atrophy of the surrounding tissues; the morbid growth extending to the nose. Ruysch, Acoluthus, Dessault and Canalle, have noticed such tumors protruding at the side of the mouth; Salbi, at the orbit; Flajani, from the walls of the sinus. The patient in the last case was aged sixty years; an operation was performed and followed by fatal apoplexy. The antrum was found filled with a large polypus which had destroyed the bones of the nose and orbit.

In cases of this kind fungous flesh pushes out from the jagged points, and penetrates all the cavities, forming an immense tumor which distorts the countenance and displaces the organs; thus the eye is forced from its socket, vision being destroyed or impaired, and respiration rendered difficult.

Symptoms.—These are local or general. Among the former we notice, impaired olfaction, involuntary flow of tears, double vision or complete loss of sight, with or without ulceration of the cornea, difficult mastication and deglutition; and finally, these tumors are insensible to the touch, but are the seat of sharp lancinating pains.

Diagnosis of Tumors of the Maxillary Sinus.—It is not easy to determine the seat of a disease in a region where there is so much liability to error. A tumor of the pharnyx, uvula or posterior part of the nasal fossæ, may penetrate the maxillary sinus and develop itself in this cavity towards the orbit; a case of this kind is mentioned by M. Prescot Hewett. On the other hand, a tumor of the sinus may make its way into the nose and develop itself there. Dupuytren and Blandin describe cases of this kind, which were mistaken for nasal polypi, and attempts

were made to extract them. In a case described by Warren, the morbid growth forced its way into the orbit and formed a tumor under the skin. Here then is a series of circumstances, added to those already formidable, with which we have to contend in locating the seat of the disease. In order to arrive at certainty, it is necessary to be guided by much experience, and that the tumor should be explored at every accessible point. The nasal fossæ, the mouth and the pharnyx should be examined by the aid of the finger, or at least, with an instrument with which these cavities may be displayed, without wounding the parts.

By exploring these cavities, we can ascertain whether any morbid mass occupies them, and if found there, whether it is soft or enveloped in a bony covering, and yields to pressure the peculiar sensation. If this examination has been necessitated by the presence of a tumor of the superior maxillary, situated in the anterior part of the bone or even in the side of the pharnyx, and if to this there be added protrusion of the ball of the eye, no doubt will remain with regard to the seat of the tumor.

The seat of the disease having been ascertained, it still remains to determine its nature. Is the tumor liquid or solid? In ordinary cases the diagnosis is simple, but we may sometimes be deceived. Thus Gensoul mistakes dropsy of the sinus with thickening of the walls for a solid tumor. An error of the same kind was committed by M. Lawrence in an analogous case, described by Stanley. M. Ferguson had a case of dropsy of the maxillary sinus, which he confounded with encephaloid tumor. M. Bertrand cites an example of a similar mistake. To avoid error in the diagnosis, the examination should be aided with a proper exploring probe, and there are cases in which, even with this means, we may fail to arrive at absolute certainty. M. Taturn cites a tumor of the upper jaw which he had eradicated; the antrum was much dilated, and a kind of encephaloidal disease had destroyed a portion of the bone.

The distinction between soft and hard tumors being established, it remains to determine the precise nature of the disease. This is attended with more difficulty. M. A. Pettit cites the

case of a child, fourteen years of age, having a tumor of the face occasioned by the kick of a horse, which was taken for a polypus. Perforation of the sinus revealed a spongy exostosis. On the other hand a tumor of the antrum may be enclosed in a bony shell, having no perforation and feeling like parchment, as observed in cysts of the jaw. It is by a thorough knowledge of all the characteristics of such morbid growths that the nature of the tumor can be ascertained. In the investigation we should avoid characteristics, common to many tumors, which are deceptive.

The consistency of the tumor, its form, its size, as well as the pain of which it is the seat, the length of time it has existed, are all circumstances which should be taken into the account in determining the nature of the disease.

The consistence of it constitutes an important characteristic; thus, fibrous and osseous tumors are hard and unyielding; their resistance is firm without elasticity. Fibro-plastic and encephaloid tumors, on the contrary, have an elasticity with marked softness in some portions of their substance.

The length of time the tumor has existed will also serve to establish the class to which it belongs; fibrous, fibro-cystic and osseous tumors are very slow in their development. Fibro-plastic and encephaloid tumors are of more rapid growth, and arriving at a certain stage of development, they double or triple their size in a short time.

After having examined the character of the tumor, and assigned it to one or other of these classes, the diagnosis may be confirmed by means of a puncturing instrument, as recommended by Professor Knes, and examining with a microscope the substance brought away.

Prognosis.—The prognosis of heterologous tumors is serious, particularly when they belong to the second category, or when they are of encephaloidal character; in this case, the disease always progresses, and is rarely retarded by a surgical operation, for these morbid productions have a fatal tendency to return.

As to the prognosis of fibro-plastic tumors they cannot be de-

termined with as much certainty as in the preceding. M. M. Bennett, Bruch and Lebert, have failed to demonstrate in a satisfactory manner, in their recent enterprising researches, their benignant character. It is prudent to avoid this question.

Comparative Prognosis.—The comparative examination of tumors of the maxillary sinus establish some very important facts in a clinical point of view. Thus, fibrous and fibro-cartilaginous tumors are local affections which can be removed by surgical operations. Heterologous tumors, on the contrary, differ from them in their constant tendency to be reproduced after the lapse of time, of a greater or less length, after they have been removed by an operation.

It would be interesting to institute a comparison between the different kinds of tumors of the maxillary antra and at different periods of life, but the present state of pathological science does not enable us to do so.

Chapter III.—*Treatment.*—The treatment of tumors of the maxillary sinus consists in the complete eradication of their substance, either by ablation or by cauterization with caustics or the actual cautery. These operations include four methods: *extirpation*, *excision*, *cauterization*, or the *ablation*, of the organ, the seat of the disease. But these operations are not always employed, the ones are exclusive of the others. Excision and cauterization are usually resorted to in connection—the one preceding the other.

The operation by excision and cauterization is not new, but was used for the removal of tumors of the maxillary sinus as far back as the time of Acoluthers and Ruysch, (1699.) The last named writer notices, in his Observations on Surgery, the history of a case of polypus of this cavity which was cauterized with a red iron. The former cites a case of tumor, also, of this cavity, for the removal of which extirpation and cauterization were resorted to. He circumscribed the tumor with two curvilinear incisions—the one in the inside of the mouth and the other upon the external side of the jaw, and after having removed a portion of the diseased part, cauterized the remainder thoroughly with a red iron. Here both operations were employed, the one

to ensure the success, excision for the removal of the tumor, and cauterization to check the hemorrhage and to destroy any portion of the morbid production that might remain.

Sometimes excision, extirpation and cauterization are all employed. But in the employment of either method, a preparatory operation is necessary to discover the seat of the disease, which consists in enlarging the opening through which the morbid production has passed, the tumor leaving no opening; it is, therefore, necessary to make a perforation into the cavity in order to reach the seat of the disease.

The fourth method, ablation or resection of the jaw, requires also cauterization to complete the operation.

These preliminaries having been gone through with, we should next consider the cases in which the interference of art is called for, and the kind of operation most proper to be performed.

Tumors of the first category, those formed of tissues analogous to normal structures, should be operated upon. But the question claiming attention before the operation, is this, whether the tumor is enclosed in the sinus as in a cyst, or whether the sinus and bone are wholly or partially implicated in the disease. In the first case, the antrum should be opened through the external wall, and if the tumor is of such a size as to require it, a portion of the bone should be cut away. In the next place, the morbid production should be removed either by excision or extirpation. The operation is then completed by touching the part from which the tumor originated with solid caustic. In the second case, if the tumor has its seat both in the antrum and jaw, as Buttner has observed, we only remove the parts implicated in the seat of the disease. If every part of the jaw is invaded by the tumor, as Hancock and Trenery have observed, then it becomes necessary to remove the entire bone.

Finally, it may be laid down as a principle, that tumors of this category should be removed by preserving as much of the bone as possible.

Are these remarks equally applicable to tumors belonging to the second category? The same distinction that we have ob-

served in tumors of the first class should be observed here. Is it enclosed in the sinus, or does it invade a portion of the jaw? In the first case, if it is thoroughly demonstrated that the morbid growth is confined within the maxillary antrum and that it does not extend without its borders, we should follow the practice of Dessault, advised by Sabatier, and since then adopted by Blaudin; open the sinus freely, even removing a corresponding portion of the dental arch, and then destroy the diseased production by cauterizing with red iron. Weinhold proposes an entrance into the sinus by removing the dental arch; by this method, this cavity has an opening through its inferior part. This is the practice adopted by Hectuthos and Dessault in a case of polypus of the maxillary sinus which had destroyed a portion of the palatine vault.

The operation which opens the sinus through its external wall in order to remove the tumor contained there presents something very simple and seducing, but surgeons who have seen it practiced often reject it.

Lisars affirms that in the greatest number of cases that he has witnessed, the disease returns; and he adds, that in view of this, unless the entire bone is removed, the morbid production should not be interfered with. He describes, besides, the latter operation which has not since been practiced, until Gensoul, without any knowledge of Lisars' work, instituted and applied for the first time the most beautiful operation in surgery for the removal of a disease of this kind.

When the tumor has invaded the jaw as well as the antrum, the complete ablation of the bone is the only operation we would advise; this is justified by the necessity the surgeon finds in limiting the boundaries of the disease and the difficulty of exactly defining them.

I only mention as insufficient the practice advised by Weinhold and Hedenus, who wish that inflammation and suppuration of the tumor should be induced by the aid of a seton, introduced through an opening corresponding to the upper jaw, crossing the tumor and brought out through the palatine vault.

Contra-indications.—In the treatment of tumors of the max-

illary sinus there are cases in which it is necessary for the surgeon to act, and others in which it is prudent to refrain. When the tumor is of small size and the constitution of the patient has not suffered, art should interpose, as in this case it may check the disease and prolong the life of the patient.

If the tumor is voluminous, without any constitutional impairment of the patient, if a cancerous cachexy is not developed, the surgeon's aid should still be called into requisition; first, because he may for a time check the disease which has a great tendency to progress; secondly, because he would have to do with a fibro-plastic tumor, the malignancy of which, if it be malignant, is less than that of an encephaloid tumor. Finally, when the tumor of the sinus is voluminous, extending in every direction, and the constitution of the patient is depraved, the intervention of art would only complicate a condition of things already too formidable.

ARTICLE II.

Second Annual Meeting of the American Dental Convention.

Reported for the Society, by WM. HENRY BURR.

THE Association of Dentists organized in August, 1855, under the name of the American Dental Convention, held its Second Annual Meeting at Hope Chapel, New York City, on Wednesday, Thursday, and Friday, August 6th, 7th, and 8th, 1856. The following is a complete list of members present, as furnished by the Secretary:

LIST OF MEMBERS.

MAINE.

S. V. HOWARD, Skowhegan.

NEW HAMPSHIRE.

D. A. STACKPOLE, Dover.
A. J. YOUNG, Dover.
L. W. HALE, Oxford.

MASSACHUSETTS.

E. G. TUCKER, Boston.
Dr. WILSON, do.
D. TRACY, Worcester.
S. P. MILLER, do.
THOMAS PALMER, Fitchburg.
C. A. WHITNEY, do.
JAS. D. BROWN, Fitchburg.
GEO. L. COOK, Milford.
M. LOOMIS, Cambridgeport.
F. SEARLE, Springfield.
FRANCIS FIELD, Waltham.

CONNECTICUT.

W. J. RIDER, Danbury.
SAMUEL MALLETT, New Haven.
J. B. WHEAT, do.
CHARLES MERRITT, Bridgeport.
JAS. S. BARBOUR, Norwalk.
C. M. HOOKER, Litchfield.
LEWIS BETTS, New London.
W. POTTER, Norwich.
H. V. PORTER, Naugatuck.
B. ST. JOHN, Wilton.
R. S. REYNOLDS, Waterbury.

RHODE ISLAND.

W. H. SMITH, Newport.
H. H. FARNHAM, Westerly.
F. N. SEABURY, Providence.
W. H. HELM, do.

NEW YORK CITY.

JOHN B. RICH,
J. H. FOSTER,
E. J. DUNNING,
GEO. E. HAWES,
F. H. CLARKE,
WILLIAM DALRYMPLE,
WILLIAM H. DWINELLE,
C. W. BALLARD,
B. F. MAGUIRE,
J. G. AMBLER,
NORMAN W. KINGSLEY,
T. B. GUNNING,
GEO. CLAY,
S. W. JUDSON,
B. C. LEFLER,
W. A. BRONSON,
JOHN ALLEN,
WILLIAM T. LAROCHE,
A. L. ROBERTS,
J. T. VALENTINE,
W. B. ROBERTS,
C. E. FRANCIS,
S. A. MAIN,
GEO. H. WHITE,
JOHN M. CROWELL,
C. S. MILES,
F. H. BURRAS,
DAVID J. STEINBURG,
W. T. W. CHAPMAN,
A. STARR,
J. H. W. VERE,
A. J. LETAMENDI,
A. P. PRETERRE,
L. BERHARD,
MAX SAHEL,
SAMUEL HESSEL,
E. C. RUSHMORE,
E. S. WATERS,
JAMES T. STRATTON,
BENJAMIN LORD,
JOHN D. CHEVALIER,
WILLIAM MICHAELIS,
A. C. CASTLE,
CHARLES D. BROWN,
EUGENE P. PRETERRE,
ROBERT B. SUTTON.

NEW YORK STATE.

JOHN BRANQUE, Brooklyn.
S. C. FRINK, do.
JONAS W. SMITH, do.
C. A. MARVIN, do.
J. J. DUMON, do.
F. W. DOLBEAR, do.
B. S. LYMAN, do.
R. McGREGOR, Rochester.
A. HOOPER, Binghampton.
L. D. WALTER, Lockport.
S. T. BARRET, Port Jervis.
CHARLES MERRY, Herkimer Co.
A. BLAKESLY, Utica.
JOHN C. AUSTIN, Albany.
C. S. WEEKS, Bedford.
S. B. PALMER, Tully.
E. H. SYLVESTRE, Lyons.
DAVID PEABODY, Elmira.
R. WALKER, Owego.
A. BLAKE, Aurora.
G. N. FOSTER, Utica.
DANIEL SMITH, Hempstead.
L. W. ROGERS, Utica.
D. W. PERKINS, Rome.
STEPHEN MAPES, Fishkill Land.
N. P. WHITE, Yonkers.
H. K. WHITE, Utica.
E. D. FULLER, Peekskill.
D. C. ESTES, Albany.
T. H. BRADISH, Utica.
C. B. FOSTER, do.

PENNSYLVANIA.

H. TOWNSEND, Philadelphia.
T. L. BUCKINGHAM, do.
A. MERRITT ASSAY, do.
JAS. E. GARRETSON, do.
J. H. GITHENS, do.
J. M. BARSTOW, do.
SPENCER ROBERTS, do.
ELISHA TOWNSEND, do.
DANIEL NEALL, do.
J. H. McQUILLEN, do.
C. N. PIERCE, do.
J. W. McCURDY, do.
S. S. WHITE, do.
J. F. B. FLAGG, do.
J. F. FLAGG, do.
DAVID ROBERTS, do.
STEPHEN T. BEALE, Philadelphia.
ROBERT ARTHUR, do.
C. A. DU BOUCHET, do.
J. LUKINS, do.
R. W. ROBINSON, do.
WILLIAM GORGES, do.
S. G. MARTIN, Meadville.
Dr. CHANDLER, Rochester.
JESSE C. GREEN, West Chester.
J. VALERCAMP, Lelms Grove.
W. A. CHITTENDEN, Scranton.
J. MARTIN, Strasburg.
J. D. WINGATE, Bellefont.
J. McCALLA, Lancaster.
F. M. DIXON, Pottsville.

NEW JERSEY.

C. A. KINGSBURY, Mount Holly.
G. C. BROWN, do.
J. E. PHILLIPS, Burlington.
J. C. ROBINS, Jersey City.
B. F. SMITH, Orange.
W. W. WARD, Newark.
A. G. P. COLBURN, Newark.
ALBERT WESTLAKE, do.
CHAS. B. THURSTON, Newark.
W. G. LORD, do.
JOHN HASSELL, do.
B. W. FRANKLIN, do.
WILLIAM MEAD, do.
G. F. J. COLBURN, do.
G. WHITAKER, Bridgeton.
JOHN LUM, Patterson.

DELAWARE.

HENRY GARRETT, Wilmington.

MARYLAND.

C. A. HARRIS, Baltimore. P. H. AUSTEN, Baltimore.
A. A. BLANDY, do. H. H. HARVEY, Hagerstown.

DISTRICT OF COLUMBIA.

J. B. GIBBS, O. MUNSON,
O. A. DAILY, C. H. VAN PATTEN.

VIRGINIA.

JOHN G. COATES, Roanoke,

GEORGIA.

GEORGE ROBERTS, Talbotson. ALBERT WILCOX, Savannah.

MISSISSIPPI.

H. C. KENDRICK, Natchez.

LOUISIANA.

J. S. CLARK, New Orleans.

MISSOURI.

JOSIAH FORBES, St. Louis. G. H. PERINE, St. Louis.
McKILLOPS, do. AARON BLAKE, do.

ILLINOIS.

T. P. ABELL, Chicago. S. P. NOBLE, Peora.
W. W. ALLPORT, Chicago.

MICHIGAN.

M. S. DEAN, Marshall.

INDIANA.

WILLIAM F. MORRILL, New Albany.

OHIO.

CHARLES BONSALL, Cincinnati. WILLIAM M. HUNTER, Cincinnati.
JAMES TAYLOR, do. HENRY B. YOUNG, Zanesville.
GEO. WATT, do. JONATHAN TAFT, Xenia.

CUBA, W. I.

ELIZCO VEDDER, Matanzas. W. L. TINKER, Havana.

Dr. John B. Rich, of New York City, President of the Convention called the meeting to order at 11 o'clock.

Dr. Charles Bonsall, of Cincinnati, the Secretary, read the minutes of the last meeting at Philadelphia, by which it ap-

peared that eighty-two gentlemen of the profession were there enrolled as members last year.

Dr. Daniel Neall, of Philadelphia, offered the following resolution:

Resolved, That all practicing members of the dental profession who may be present, and feel desirous of co-operating with us, be considered as, and hereby are, active members of this Convention, and are requested to sign the articles of association at their convenience.

The Chair ruled the resolution out of order, and cited the 3d and 4th articles of the Constitution to sustain his decision, as follows:

Art. 3. The Convention shall consist of members of this Convention who shall sign these articles of association, and of such other practitioners of dentistry and auxiliary branches of science as shall hereafter be elected to membership, and in like manner sign these articles.

Art 4. Candidates for membership shall be nominated by a member of this Convention at any of its meetings, and every such candidate as shall receive a majority of votes cast upon the question of his admission, shall be declared duly elected.

Dr. J. H. McQuillen, of Philadelphia, moved that the above articles be suspended.

Dr. W. H. Dwinelle, of New York, was in favor of the suspension of these articles. He desired the Convention to be an open one, and the platform they should lay down a broad and democratic one, with as little machinery as possible to carry out the ends they had in view. According to the spirit of the articles which they were called upon to suspend, it was necessary that they should go through considerable ceremony, which would greatly retard the business before them. He desired to give their friends who were strictly members of this Convention the right hand of fellowship at once, in order that they might feel entirely at ease. He trusted, therefore, that the motion to suspend these articles would prevail.

The vote was then taken, and the two articles were accordingly suspended.

Dr. Neall now renewed his resolution. He wished to make the organization the simplest possible, that could keep a body of men together.

Dr. Elisha Townsend, of Philadelphia, moved to amend by substituting "at liberty" for "requested."

The amendment and resolution as amended were adopted.

Dr. J. M. Crowell, of New York, inquired if gentlemen engaged in auxiliary branches of the profession were now to be considered as taking part with the Convention.

The Chair ruled that they were not—none but practicing dentists.

Dr. C. W. Ballard, of New York, moved the following resolution:

Resolved, That the gentlemen who have been practicing dentists, and who may be now engaged in the auxiliary branches, be admitted upon the same footing as dentists, or any person the Convention may nominate be admitted as members.

Dr. E. Townsend, of Philadelphia, wished the mover of the resolution to explain what he meant by auxiliary branches. He granted that this Convention, as a body, might receive a great deal of light and knowledge from all the collateral branches of science, which might be called so far auxiliary branches to their profession; but the question of admitting members of all the auxiliary branches to a vote in this Convention was quite another matter.

Dr. Ballard in reply said that he meant precisely that class of persons who were admitted to a seat in the Convention at Philadelphia last year.

Dr. McQuillen stated that a prominent editor of a magazine and another person who had been a practicing dentist were elected members last year, while Mr. Abby, a manufacturer of gold foil, was rejected.

Dr. Ballard said, that Mr. Abby was ruled out, and as regards the other gentlemen, his impression was that they signed the Constitution without being voted for.

Dr. L. W. Rogers, of Utica, thought that the passage of the resolution would be opening the doors of this convention rather

too wide. The words "auxiliary branches" might include all persons who had ever made anything that was used in the practice of dentistry. If there were persons engaged in making teeth, or editing dental journals, who desired to be admitted as members of the Convention, their names could be presented singly to the Convention, and the question of their admission then be acted upon. They ought not to adopt a general rule in reference to this matter, for they would then likely be overrun by all kinds of mechanics claiming to occupy seats in the Convention.

Dr. J. S. Clark, of New Orleans, stated that the gentlemen alluded to by Dr. McQuillen as having been elected members at Philadelphia, were Drs. McCurdy and White, who came in as dentists; the resolution to admit Mr. Abby was withdrawn.

Dr. Bonsall believed that every member admitted last year was a practicing dentist.

After various amendments offered and suggested, the resolution was shaped so as to admit gentlemen who have been practicing dentists, but are now engaged in auxiliary branches, or any persons that may be nominated and elected as members.

Dr. L. W. Rogers, of Utica, moved that the resolution be laid on the table. Agreed to.

Dr. S. S. White, of Philadelphia, did not like to lie under the suspicion that himself and partner came into the Convention by permission. When his name was proposed he said he was not a practicing dentist, but, nevertheless, he was elected.

The Chair ruled that while none but practicing dentists had a right, by the resolution, to take part in the Convention, those who had already signed the Constitution were not excluded.

Dr. Neall appealed from the decision of the Chair, and the question being taken on appeal the Chair was sustained in ruling out of the Convention "practitioners of auxiliary branches of science" mentioned in one of the suspended articles of the Constitution.

Dr. F. Searle, of Springfield, Mass. moved to restore the suspended articles 3 and 4.

Dr. Dwinelle, of N. Y., said that the words "practical" and

"practicing" sounded very much alike, but they were very different. If they adopted the word "practicing" in their admission of persons to seats as members of this Convention, they would exclude very good dentists, who were temporarily out of practice. The resolution ruled them out because they would not be "practicing" dentists, although they might be "practical" dentists. He wanted a greater latitude in this respect than was now allowed by the resolution.

Dr. Clark, of N. O., stated that, as chairman of the committee that had this matter under advisement, he would explain that the object of the provision in the Constitution was to obtain the assistance of men engaged in collateral sciences, such as chemists, and members of the medical profession.

After some further discussion, the motion to restore was laid on the table, with the understanding that persons who were not practicing dentists should be nominated and voted upon for membership. The following gentlemen were accordingly elected *viva voce:* C. S. Miles, Solyman Brown, J. D. Chevalier, and Robert B. Sutton, all of New York. The admission of Mr. Chevalier was opposed, he being a dental instrument manufacturer, but he was elected by a vote of 17 to 14 on a division.

Dr. John Branique, of Brooklyn, moved to admit John Kiersing, manufacturer of gold foil and teeth.

The motion was opposed by several members and the candidate rejected.

The Chair appointed the following committee to report the order of business for the Convention:

Drs. Clark, La.; Kendrick, Miss.; Howard, Me.; Miller, Mass.; Helm, R. I.; Potter, Conn.; Clark, N. Y.; Robins, N. J.; Young, N. H.; Buckingham, Pa.; Garretts, Del.; Harvey, Md.; E. Henry, Ga.; McKellops, Mo.; Allport, Ill.; Taylor, O.; Gibbs, D. C.; Deane, Mich.

Dr. McQuillen, of Philadelphia, Corresponding Secretary, being called upon for his report, stated that 2,800 circulars had been printed and sent off to different parts of the Union. He had received various letters but none of sufficient importance to present. Report accepted.

Dr. Bonsall, Recording Secretary and Treasurer, made the following report:

Amount paid for book and stationery, . .	$ 1 10
One hundred copies of *Daily Sun*, (Phila.) .	1 00
Advertising, ...	1 00
Use of Hall, ...	9 00
Services of Janitor, ...	2 00
Circulars, ...	63 85
Bills paid by Dr. Rich for cards, canvass, sign, etc.	10 00
	$87 95
Amount received, ...	72 00
Balance due, ...	$15 95

Report accepted.

Dr. Clark, from the Business Committee, made the following as a partial report of the order of business:

After an address by the President, 1st. Election of officers; 2d. The pathological condition of diseased dentine, and its treatment; 3d. Best preparation of gold for filling.

The President remarked that, by the articles of association, it was made his duty to address the Convention upon such subjects as he might deem useful and important for their consideration. This duty he would respectfully decline, as the Convention was composed of those whose collective wisdom it would be presumption in any individual to advise. He took occasion, however, to report certain expenses which he had incurred in behalf of the Convention for the use of the room, and for a full report of the proceedings. The cost of the room would be $12 and $2 for janitor. The cost of a report of the proceedings, supposing it should not exceed a certain amount of matter, would be $50.

On motion, the report of the Chair was received and adopted.

The next business in order being the election of officers,

Dr. F. H. Clark, of New York, moved that the officers nominated be elected by ballot, and that if no majority was obtained on the first ballot, then the three highest be put in nomination,

and that a plurality should elect on the second. Carried, and Drs. Taylor, of Ohio, and Dalrymple, of New York, were appointed tellers.

The following officers were, after balloting, declared elected:

President—Chapin A. Harris, of Baltimore.

Vice-President—Daniel Neall, of Philadelphia.

Recording Secretary—Elisha Townsend, of Philadelphia.

Corresponding Secretary—W. W. Allport, of Chicago.

On the ballot for President, Dr. Harris received 47 votes; Dr. Neall 19, and Dr. Rich 15; scattering, 22. The two latter candidates having declined, Dr. Harris was, on motion, declared unanimously elected.

On the ballot for Vice-President, Dr. Neall received 31 votes; Dr. Dwinelle, 21; Drs. Blakeslee, Taft and Crowell, 6 each; scattering, 14. The three lowest candidates having withdrawn, a formal ballot was taken upon the two highest, when Dr. Neall received 53 votes, and Dr. Dwinelle 17. The election of Dr. Neall was then, on motion, declared unanimous.

The resolution of Dr Clark, of New York, was, on motion of Dr. Kendrick, of Natchez, suspended for the election of the Secretaries, and all the candidates nominated having declined, except the gentleman named above, they were elected *viva voce.*

The Chair appointed Dr. Clark, of New Orleans, and Dr. Townsend, of Philadelphia, a committee to escort the President elect to the Chair.

On motion, the Convention took a recess till 4 o'clock.

Afternoon Session—The Convention having been called to order, the President elect was escorted to the Chair by the committee appointed for that purpose.

Dr. Rich in retiring from the chair, returned his thanks to the Convention for their uniform kindness and support toward him in the discharge of his duties. It was a source of great gratification to him to find that he had always been supported and sustained during his term of office. (Applause.)

Dr. Townsend, of Philadelphia, introduced the President elect as the pioneer of Collegiate Dental Education, not only in this country but throughout the world, and as one of the first

who advocated dental association. He felt proud to see him take his place at the head of this democratic convention of dentists. (Applause.) His generosity and good nature were known to every one of them, and his heart, like his body, was large enough to take them all in. (Laughter.)

The President scarcely knew how to thank them for the honor conferred; it was the more gratifying because unsought. He promised to use his best efforts in the discharge of the duties that devolved upon him in a faithful and impartial manner, but having had little experience in presiding over deliberative bodies, he begged their kind indulgence and assistance. (Applause.)

On motion of Dr. Ballard, a vote of thanks was unanimously tendered to Dr. Rich, the retiring President, for the very able manner in which he had discharged his duties.

Dr. Rich thanked them for their appreciation of his efforts.

Dr. Clark, of New Orleans, was instructed by the committee on business, to report the following resolution:—

Resolved, That in the discussions each member be limited to — minutes.

Motions were severally made to fill the blank with 15, 10 and 5 minutes. The ten minutes rule prevailed, and

The Convention then took up as the next business in order the subject of the

PATHOLOGICAL CONDITION OF DISEASED DENTINE AND ITS TREATMENT.

Some hesitation being shown by members about leading off in the discussion,

Dr. Clark, of New Orleans, suggested that Dr. Geo. Watt, of Cincinnati, read a paper on the subject.

Dr. Watt preferred, as his paper related to remedies, that the pathological condition should be first discussed.

Dr. James Taylor, of Cincinnati, by particular request, opened the discussion. He considered this as decidedly one of the most important subjects that could be brought before this body. A great deal had been written upon it, but when they came to compare it with their own observations, they found

that a great deal had been left unsaid. All disease to be correctly treated, should be perfectly understood; when they could get at the cause of the disease, they were, to a certain extent, prepared to go to work and apply the appropriate remedy. Every individual who had practiced the profession, must have noticed that all the conditions of decay were not of a similar character, but presented very different modifications. They often had to deal with excessive sensibility, and generally in connection with that, there was a peculiar physical condition of the disease going on. There were many who did not stop to inquire into the causes producing this certain condition of disease. They could not take it for granted, for instance, that they had the same causes of disease in the sensitive condition of the dentine as they had in cases where there was no sensibility at all. To treat properly these cases, they must necessarily inquire what were the causes producing this difference. He took it for granted that in a healthy condition of the dentine there was a circulation kept up through the dentine itself, and there was not therefore, an excessive sensibility. All the changes which took place then, in this condition of dentine, he regarded as a pathological condition, departing from health. There were three, four or five different kinds of decay; he would speak of three of the most prominent. In the first place, there was the black decay, which had very little sensibility. In this, there was a mere deadening of the dentine, a breaking up of the circulation, and a destruction of the vitality, ordinarily without much disintegration of the parts. In the second place, there was the brown decay, in which there was a disintegration of the parts, the living or earthy portion in most cases being entirely destroyed, leaving the cartilaginous portion in a soft state. Then, there was a third variety, called the white decay, in which more of the cartilaginous portion of the tooth was destroyed than of the earthy part. These three different kinds of decay were certainly caused by different agents, and required very different treatment. In the first, there was very little sensibility, in the second, sometimes a great deal, and in the third always an excess, unless the case was modified by certain condi-

tions of the secretions of the mouth. The chemical agent which acted upon the cartilaginous parts was certainly different from that which acted upon the living parts. By immersing bone in muriatic acid nearly all the lime would be removed, showing conclusively that a different chemical agent caused the brown decay from that which caused the white. Hence the importance of understanding this subject in order to get at the proper treatment. Even after the best surgery, the organs were liable to further progress of the disease.

Dr. TOWNSEND, of Philadelphia, said that he was here to obtain instruction upon the subject, and therefore, he did not feel authorized in saying a great deal upon the question now under consideration. He had noticed the same conditions of dentine of which the preceding speaker had made mention. He had felt, as doubtless they had all more or less felt, that when they removed the carious portion of the tooth, they had not done all that he hoped some day to see their profession doing for the patients who should come under their hands. If they did nothing but remove the portions of the tooth which were decayed, and render it mechanically and artificially sound, so far, perhaps, as that particular spot was concerned, they had done their duty; but certainly, they had not made their art a scientific one, unless they looked farther than this, and unless they looked to the prevention in other parts of the mouth of the same effects resulting from the causes which produced the effect in this particular spot which they had carpentered. It was necessary that they should know something more of the pathological condition of the dentine than a great many of them did know. Perhaps they were all deficient in this kind of knowledge, and a good many of them perhaps had been satisfied with merely the routine practice of cleaning out cavities in the teeth as if their whole duty to their patients and the dental profession was thereby fulfilled. It reminded him of a remark made by a gentleman to him when he commenced his profession. "So," said he, "I find you have got to be a mouth carpenter."

Very early in his practice he had ascertained these conditions. He found in some cases that this exciting sensibility

was almost unbearable, and that the sensibility was, like that of all the other nerves, greatest at the extremities, closest to the enamel or between the enamel and the dentine, and that frequently when he cut in below, the sensibility was entirely gone. This sensibility he attributed to inflammation of the dentine, analogous to that produced by a wound in any other part of the body. Accordingly he suggested to an anatomist of considerable skill whether there might not be a circulation in the dentine out entirely to the borders of the enamel, and whether there were not fibrous nerves passing through the whole body of the dentine which caused extreme tenderness in some cases from inflammation. His friend laughed at him, and said that there were no nerves there to become inflamed. He, however, ascertained that in excavating a deep cavity that ran into the medullary membrane the sensibility at the extremities was entirely gone. This proved to him by deduction that the tenderness existed in the branches of nerves that could not be discovered except by a powerful microscope. He had since had the pleasure of seeing these branches of the nerves by means of a microscope, extending out to the enamel, and some instances actually penetrating half way through it, proving his hypothesis correct by actual observation.

He had not found, he was sorry to say, how to correct these diseased conditions. That was a great thing to be discovered, and would, if discovered, be what many of them now considered one of the ultimatums of their labors.

Dr. Dwinelle, of New York, indorsed the theory of Dr. Townsend. The dentine was ramified by tubuli which lay at right angles with the nerve, as he had seen through a microscope. He had some specimens which he would be happy to show to any member at his office. The tubuli were 1-6,000 or degree. The exact nature of inflammation of the dentine they all would admit that they did not understand, although the subject was much better understood now than a few years ago. There was much for them yet to learn in regard to the pathological condition of the teeth. It was impossible to ignore

this condition, and operate with success upon the decay of the teeth. This condition was modified by various circumstances, by the characteristics of the teeth, by the constitution of the person, and by the action of the agent producing the decay. In many cases the sensibility was only at the point of union with the enamel; sometimes it extended at a particular point within the cavity; sometimes the entire dentine of the crown of the tooth was inflamed, and sometimes it was to be found only within the lamina outside of the cavity. It would be nonsense to apply the same remedy to all these cases. If the inflammation was not stopped, the undecayed, as well as the decayed teeth, would partake of the sensibility. There were cases where it was impossible to reduce the sensibility without constitutional change or treatment, and common sense suggested that that treatment should be different.

Dr. McQuillen, of Philadelphia, had always questioned applying the term inflammation to that condition; he thought inflammation impossible. Was it possible that tubuli 1-10,000th of an inch in diameter could become the seat of inflammation? The existence of blood-vessels in the dentine he considered a work of supererogation. Could not the circulation go on without the use of blood-vessels? Did we not find a circulation of sap in the vegetable economy, where the vessels absorbed it like a sponge? He conceived that the circulation in the dentine was analogous to that, and if there were no blood-vessels how could there be inflammation? Heat, swelling, tenderness and redness, were described as conditions of inflammation. It was said by some that they had discovered blood in the dentine. If so it was due, in his opinion, to a rupture of adjacent blood-vessels forcing the blood into the tubuli and producing discoloration. The tendernes of the dentine was discovered only when touched by the instrument; in inflammation, pressure upon the part only increased the pain that was already there. It seemed to him, 1-7,000 of an inch in diameter, and were subdivided so as to form little canals or caniculi. What fluid charged these tubuli was matter of hypothesis; it was probably more

subtile than the ordinary gross fluids of the body, something like the electric or neuratic fluid. The most sensitive part of the nervous system was the surface; a scald or burn produced a hundred fold more pain than the severing of a nerve. That seemed to be a law of the animal economy, and it held good in reference to the teeth, the most sensitive part of the teeth being the outer surface of the dentine covered by the enamel, and the most sensitive point of the most sensitive part was where the dentine formed an acute angle with the enamel at the furthest surface. Dr. Maynard, of Washington, several years ago suggested the propriety of severing the tubuli at the lowest point, for the purpose of destroying the sensitiveness. The idea was a philosophical one—to cut them off at the base.

The remarks of Dr. Taylor were correct concerning dental caries. With regard to remedies, he had found the best one to be a solution of chloroform and chloride of zinc, and before the Convention adjourned he hoped to have the privilege of reporting a case of the excision of the superior maxillary in which he used the solution with most happy results.

Dr. D. A. Stackpole, of New Hampshire, had examined the tubuli through a microscope, but he was not satisfied that any fluid existed in them. They were there for a wise purpose undoubtedly, but what that purpose was, he conceived was not yet ascertained. He found in his practice that in some instances the nerve extended not only through the dentine, but through the enamel. In some cases they would find that, by rubbing an instrument or the finger nail even upon the enamel, there would be extreme sensibility manifested. A patient, under these circumstances, frequently would ask to have the cavity of the tooth filled, when, in reality, there was no necessity for it. He trusted that this matter would be fairly discussed.

Dr. Jonathan Taft, of Zenia, Ohio, said that the condition of the diseased dentine which the dentist most frequently met was an inflamed and sensitive one. This condition was attended with various circumstances, and was various in its character and therefore, that it was incorrect to call this sensibility, inflammation, and that it was more reasonable to suppose that the

pain is induced by impressions made upon the delicate nervous filaments that are in the tubuli. He believed with his friend, Dr. Neall, that the most efficacious remedy was a sharp instrument.

The PRESIDENT, at the suggestion of Dr. Rich, made a few remarks upon the subject. He had but a single thought that he wished to bring forward at this time, having elsewhere treated on the subject at considerable length. Between the dentine and the enamel was a membrane, termed by Raschkow, the preformative membrane; others had termed it the true or persistent membrane of the pulp of the tooth. In his opinion, that membrane performed a more important part than was generally supposed—a different function from any that had ever been ascribed to it. Accident had revealed to him that function. But he would ask to be excused from giving his views upon this subject now, as he was very desirous to meet his family a few miles out of the city, from whom he had been separated several weeks. He would return to-morrow morning, and would then, if opportunity offered, take great pleasure in describing the nature of his discovery.

Dr. NEALL, (Vice-President,) accordingly took the chair. He conceived that the dentist ought to know everything of the physiological as well as the pathological conditions of the dentine. He sometimes found it impossible to fill the soundest tooth without making the patient vibrate like a fiddlestring.

Dr. SMITH, of Connecticut, considered all theories and speculation on this subject as of little practical benefit. It was very evident that exalted sensibility was a disease; would any gentleman show us a sure remedy? Some had tried this and some the other thing. He had adopted a very simple remedy. He had been led to believe that the sensibility was communicated through the medium of the gums, because he found that by cutting away the gums a little, he could excavate without pain. He was not sure whether it was imagination, or whether it was that the cutting of the gums caused so much more pain, that the patient was enabled to submit to the operation so well. He had tried chloroform and chloride of zinc in numerous instances

and had produced satisfactory results in, perhaps, one case out of seven. With chloroform alone he removed the sensibility for the moment so as to cut away the decay without pain. With chloride of zinc alone he thought he had sometimes received benefit.

Dr. Starwin, of Norwalk, Conn., had tried all the various remedies, but found them uncertain; and the only thing he could rely upon was a sharp excavator, and to excavate close to the enamel. He had found one patient upon whose teeth it was impossible to operate; he was all nerve. Patients who had highly sensitive teeth had generally a disordered system, particularly the bowels. He had been in the habit of prescribing cathartics for such, and after getting the system regulated, he found he could operate with far less sensitiveness on their part. There were cases, however, where he could not remove the sensibility at all. In a case that he operated upon yesterday where the tooth was extremely sensitive, he had put ether into the cavity, and after half an hour excavated it and filled the tooth, with a considerable less degree of pain than the patient had suffered heretofore. He, however, considered it more the effect of the imagination than anything else. Excavation with a sharp instrument immediately between the enamel and the dentine was the best remedy in his judgment.

A Member asked Dr. S. how long it took to bring the system to the right state by the use of cathartics.

Dr Starwin replied, from three days to three months.

Dr. Rich inquired if he left the cavity in the tooth open during the time he was treating the system in the cases where it took three months.

Dr. Starwin said he did.

Dr. S. V. Howard, of Me., had found that an application of pulverized spanish flies would, in some cases, destroy the sensibility in a very short time. He had found, what others probably had observed, that by cutting in a different direction with the excavator, he could get along with a sensitive patient pretty comfortably in nine cases out of ten.

Dr. F. M. Dixon, of Pottsville, Pa., said that his own expe-

rience, he must confess, had been the reverse of that of Dr. Starwin ; he had found some of his most nervous and sensitive patients to be those who were the most healthy and whose digestive organs were in a good condition. In regard to this sensibility of the dentine, nature seemed to have been very irregular—more so than in any other part of the system; and the idea had occurred to him that if the nerves were to be found running in different directions in the dentine, some teeth might be less supplied with nerves than others, and some particular parts of the same teeth less supplied than others. And this idea seemed to be borne out by the fact that the dentine was found to be more dense in some parts than others.

The different kinds of decay had been alluded to by Dr. Taylor. He conceived that, perhaps, the cause of these different kinds of decay were attributable more to the condition or structure of the teeth themselves than to anything else. For instance, the white decay was found in very white, chalky teeth, and seldom in teeth of dense structure, which were more commonly affected by black decay. He would merely throw out this suggestion to lead others to make their observations.

On motion of Dr. Bonsall, it was ordered that when the Convention adjourn it be to meet at 10 o'clock to-morrow.

The Convention then adjourned.

SECOND DAY.—MORNING SESSION.

The Convention assembled at 10 o'clock.

Dr. Clark, from the Business Committee, reported that they had assigned 12 o'clock, M. for the reading of a paper, by Dr. Townsend, of Philadelphia, on "Professional Fees."

Dr. Townsend, of Philadelphia, announced that a meeting of the American Society of Dental Surgeons was held at 9 o'clock, A. M., and that they refused to consider anything but the business laid over from last year, viz. the expediency of dissolving the society ; and the society voted unanimously in favor of the dissolution. The announcement was received with applause.

DISEASED DENTINE.

This subject being resumed,

Dr. Geo. Watt, of Cincinnati, by express desire of the convention, read a paper on the subject of the "Action of Pathological Remedies on Inflamed Dentine." He stated that it was written for publication in the *Dental Register.*

Dr. Robert Arthur, of Philadelphia, said that the question now under consideration had been discussed by their profession over and over again. He had nothing particularly new to say upon the subject. He had listened with a great deal of pleasure to the reading of the paper just presented to the Convention. There was not only a mechanical, but a physiological point of view, in which this question was to be considered. He proposed to present very briefly his views in regard to this matter of inflamed dentine. The condition of dentine termed sensitive, was not a healthy condition, and was a change from a normal condition. This fact was well established, that although the dentine of a perfectly healthy tooth had a certain degree of sensibility, it was increased when caries set in, and it was exposed to contact with the fluids of the mouth. This was illustrated by the fact that when a carious cavity was prepared for filling, which was slightly sensitive, it became still more so after a lapse of time. The term inflammation, as applied to this condition of the dentine, had been objected to; but there was such a vital change in the parts that it was impossible, with their present knowledge upon the subject, to apply any term which would more clearly express the exact condition. Inflammation, so far as they could at present define it, was a local effect produced by the action of agents capable of producing irritation of the parts, a change of the circulation and nervous sensibility. Inflammation was not always accompanied by pain. It might lead to a simple exaltation of sensibility or a nervous irritation of the parts. Their knowledge of the intimate relation of the teeth was very imper-

fect. It was impossible to state clearly how the vital changes, even in the more vital tissues where vessels could be traced, went on. Whether an increased circulation took place in this part or not, it was impossible in their present state of knowledge to ascertain. It was precisely the case with the dentine as it was with any other vital tissue, if it could be protected from the action of irritating agents the sensibility would pass away or be relieved. It was not always possible to do this. Sometimes the caries was exceedingly slight, so that it was impossible to obtain a sufficient cavity in which to place any substance to protect it from the destructive agencies. Whenever it could be done, without danger of injury to the pulp, a temporary filling composed of a substance which would resist the action of the fluids of the mouth was sufficient, if the patient could take sufficient time for the parts to become restored to a healthy condition. That fact had been well established, and hence this was one of the most reliable methods of treating exalted sensibility. But in the great majority of cases it could not be done on account of the nearness of the pulp. In these cases escharotic substances, capable of destroying the vitality of the part, might be used with advantage and safety

Of all the agents used for that purpose known in the profession, that which had been found the most reliable was arsenious acid. The great objection to the use of arsenic was its liability to absorption. Besides the chemical view of this subject, there was another view to be taken. In order that absorption might go on, vitality was necessary. This was evinced in cases of carious bone. Absorption did not take place in a portion of bone deprived of vitality; and this was precisely the case with devitalized dentine; when the superficial layer of the dentine was deprived of vitality by arsenic, it lost its powers of absorption. It was the fact nevertheless, that in time the arsenious acid would pass through the devitalized dentine to the pulp, but that was simply by infiltration through the layers of the dentine. Such was his view of the matter.

The question then was, how could it be used with safety? Arsenious acid, in his opinion, might be applied with perfect

safety, if the cavity of the decayed tooth was a superficial one, and if the arsenic was not allowed to remain too long. The most sensitive parts of the tooth to excavate were those lying nearest the edge of the cavity; and in many of these cases, it was sufficient to protect the thin line of dentine over the pulp by a layer of wax, and then apply the arsenie upon the superfices of the cavity. This was not a mere matter of opinion; an experience of some fifteen years justified him in saying that it was a safe and proper remedy if judiciously used. Much had been said against it because of the frequent injury arising from its injudicious use. Still where it could be avoided, of course it should be, and a few sharp cuts of the instrument would remove the difficulty.

Dr. Wright, of Ohio, inquired if he used arsenious acid in combination with any thing else?

Dr. Arthur said he used arsenious acid alone, and until a few years past he had always used it dry. His usual practice was to allow it to remain ten or twelve hours only to avoid any possible danger. In some cases the sensibility was not destroyed, but rather increased, by one application, in which case a further application was necessary. He had used arsenic in form of cobalt, which was less dangerous; that might remain twenty-four hours. He had never seen any instance of the destruction of the vitality of the tooth, even after the lapse of many years, where arsenious acid or cobalt had been used.

Dr. Rogers, of Utica, asked if he put in anything to neutralize the acid?

Dr. Arthur said he usually did not, but in twenty-four hours he did not fear the penetration of it to any depth.

Dr. Allport, of Chicago, inquired if he put in anything to neutralize the acid before he put in the temporary plug.

Dr. Arthur,—Nothing, whatever.

Dr. Colburn, of Newark, New Jersey, said that with reference to the brown decay, which they all had no doubt found the most sensitive, had made use of mechanical pressure as the surest remedy. He had been more successful with it than with all the applications put together. He applied his finger cover-

ed by the napkin to the edge of the gum in contact with the decay and pressed with great force, after which he could excavate successfully in cases. The decay could most generally be removed in a continuous lump. There were some cases, however, in which he could not get at it. He did not conceive the sensitiveness to be conveyed through the tubuli, but through the periosteum. If the sensitiveness was conveyed by the nervous system through the tubuli, why would not the bottom of the cavity be as sensitive as the top? There seemed to be a sympathy between the edge of the gum at the junction of the enamel and the bony part, and the pressure of the finger nail would usually entirely destroy the sensitiveness. If the finger nail was pressed just below the gum in a healthy mouth, the same sensitiveness would be produced as existed in the case of this disease. He referred only to brown decay on the outer surface of the teeth.

Dr. Ballard, of New York, thought the gentleman had a peculiar physiological theory of his own.

Dr. Colburn said he offered the result of his own experience, and the members of the Convention might receive it as they thought fit.

Dr. Rogers, of Utica, had used arsenic some twelve years ago to destroy pulp, and was induced to use it to destroy dentine where it was extremely sensitive. Previous to doing so he had no knowledge of its being used for that purpose. The operation was successful in destroying sensitiveness. He saw his first work done in this way some three years afterward, but was not quite satisfied with its appearance. He thought it appeared slightly discolored beneath. He had at first used it more as an experiment, but for the last three or four years he had used it with more confidence, and recently having had occasion to inspect some work done three or four years ago where it was used, he found it looking very well indeed.

Dr. Rich inquired, if in the first case the discoloration appeared to be in the whole body, or immediately under the filling.

Dr. Rogers replied that it appeared in the whole body of the

tooth; but that was the only case he had discovered with such an appearance, and he was pretty well satisfied that he had not treated it as he ought to have done—that he had allowed the arsenic to remain too long.

Dr. Kendrick, of Natchez, inquired if he used in that case dry arsenic or in solution?

Dr. Rogers.—Dry.

Dr. Rich inquired of the gentleman from Newark, how he managed to get his finger nail under the edges of the gum when the tooth was very small—if he had his nail sharpened into a point. It seemed to him a mechanical impossibility.

Dr. Colburn.—When it is a mechanical impossibility, I do not expect to do it. (Laughter.) He had, generally, however, been able to accomplish it; if any gentleman had found it different he would like to hear it.

Dr. Searle, of Springfield, thought the secret of the effect produced of destroying sensibility was by producing another pain.

Dr. Colburn admitted that there might be something in that.

Dr. Ballard, of New York, had during the last four months, a family of four young ladies under his care, whose teeth had been treated with arsenic. The dentine was extremely sensitive and the cavities were nearly all superficial. They had lost several teeth, and altogether they had some twenty-seven or twenty-eight teeth whose vitality had been entirely destroyed by the use of arsenic. One of them, he believed, had ten teeth discolored. In two or three instances the nerves had been exposed, but generally the decay was superficial. The teeth had been mostly operated upon two or three years ago with arsenic.

He had great faith in sharp instruments, but he frequently used chloroform and chloride of zinc.

But there was a remedy which had not yet been referred to, though it could hardly be considered a point of practice; it was simply leaving nature herself to perform the cure. If the dentine was simply protected from foreign influences, and left to itself, it would entirely recover its tone. It was necessary in that case to prepare the cavity as carefully as possible, and put in a temporary covering of gutta percha or wax.

Dr. Arthur inquired if the dentist who had operated on the teeth of the four young ladies was a skillful one.

Dr. Ballard said he had a high reputation as an operator and his work was handsomely done. He had understood from them that the arsenic was put in one day and taken out the next.

Dr. Flagg, of Philadelphia, thought the last speaker rather too sweeping in his remarks against the use of arsenic. It was liable to accident, it was true; but every gentleman of the profession present knew that it could be used with safety in the hands of a judicious operator. They were much more liable to accidents with that agent, because it was much more active and powerful than any other agent. He would never allow it to remain in the cavity of the tooth longer than five hours at a time, for he considered if it remained longer than that time, it would penetrate the tooth so much as to produce material injury. Some years ago he removed the crowns of four incisor teeth, together with the two cuspidati, for the purpose of inserting artificial crowns. They were most of them very sensitive, and being belated in the operation instead of depending upon an instrument to probe the nerve cavities, the nerves being alive, he made an application of arsenious acid, directing his patient to take it out before she slept, to rinse the mouth, and then apply cotton to the cavities, and return to him in the morning to have the crowns placed upon the roots. He saw nothing of her for two weeks, when she told him that the roots had been so comfortable that she had no occasion to call. He found on removing the little pledget of cotton, that the periosteum of the roots were so far destroyed, that the roots came away in the attempt to remove the cotton. Everything was in a healthy condition previous to his applying the arsenic.

Dr. Taft, of Ohio, said that when a case of sensitive dentine was presented to them, they must consider the modifying circumstances attending it. The same course of treatment could not be indicated, of course, in all cases. The treatment that would be indicated in the teeth of a young person might not be indicated in the case of an older person, although the same constitutional peculiarities might exist in both cases. When a case

was presented to them, they must consider all the circumstances attending it—what were the constitution and age of the patient, the peculiarities of decay, the nature of the agent producing the decay, the amount of sensibility to be allayed, and whether it was of a chronic or acute character. These circumstances should all be considered before they went to work, in order to treat the cases in their hands rationally; and when they had ascertained all these circumstances, they could then indicate the treatment to be adopted. It was always desirable that the dentine should retain its vitality. To accomplish that, sometimes constitutional treatment was necessary; in other cases it was sufficient to shield the part from the action of exciting agents. He had found Hill's stopping as good as anything else for temporary filling; it was more easily applied than gutta percha, would not contract by cooling, and would remain longer in the cavity.

Again, it was sometimes necessary to destroy the sensibility or vitality of a particular part, and at the same time shield the other parts so as to preserve the life of the tooth. It was desirable that all the dentine left should retain its vitality. Some agents would produce the decomposition and death of a thin lamina of dentine without injury to the rest—such as nitrate of silver and chloride of zinc.

Again, it was sometimes required to destroy the vitality of the entire tooth, in which case, arsenious acid was the proper agent. Chloride of zinc acted only on that portion of the living tissue with which it came in contact, and in a very little while it became satiated and would act no further; and so with nitrate of silver, tannin and creosote, but not so with arsenic. Arsenic was absorbed by both the living and dead dentine by capillary attraction, and conveyed to the periosteum producing suppuration; hence the necessity of using it with great caution. In many cases, particularly in young persons, where the teeth were highly vascular, it would be improper to use it at all. Some twelve years ago he had applied it to a very small cavity in a central incisor of a lady sixteen years of age. It was applied in the evening and in the morning it was removed, and the next

day the tooth was excavated and filled. After three days it became slightly painful and appeared of a deep bluish cast, and on removing the filling and drilling into the cavity, he found the pulp dead. The arsenic had remained in the cavity fourteen or fifteen hours.

Being asked if it was not possible that the death of the tooth was caused by mechanical pressure, Dr. Taft replied that he was not aware of any pressure being applied; the teeth were separated sufficiently by nature.

Dr. Clark, of New Orleans, said the main question of interest to the profession was not, how they could save their patients from pain, but how they could preserve the life of the tooth. He was very well satisfied with the direct surgical treatment in all cases of superficial caries. But, to leave this question for a more interesting one. After excavating a deep seated caries in a large molar or bicuspis tooth after a thorough examination of the diseased part by a microscope, he had often been unable to determine whether he ought to remove or treat in order to save the life of the tooth. Leaving aside all minor considerations of pain in excavating, could gentlemen tell him the pathological condition of the dentine when it presented a soft and sometimes discolored appearance, where great care was required to avoid reaching the pulp and ruining the tooth; and could they give him a treatment that would save the life of the tooth? He was very anxious for light upon this point. It had been a matter of serious investigation with him, and he had no doubt he had sacrificed many teeth where they might have been saved—some operating where he should not have done it, and some by postponing the operation.

DENTAL FEES.

According to appointment, Dr. Townsend, of Philadelphia, read a paper on "Dental Fees," which was frequently applauded.

Dr. Rogers offered a resolution, "That a vote of thanks be given to Dr. Townsend for his very able paper, and that it be published in pamphlet form, to circulate among the members at the expense of the Convention."

A Member asked if the paper was the property of the Convention, Dr. Townsend, or Dr. Clark?

Dr. Townsend believed he had the right of disposing of the paper, and he, therefore, gave it into the hands of the Convention to do with it as they pleased.

Dr. Rogers would like that the paper should be published, and offered his resolution in an amended form, so as to order that a certain number of copies (which were left blank) should be published.

Dr. Neall hoped it would be published, as proposed by other gentlemen, by putting their hands in their pockets.

Dr. Townsend said that in order to defray all expenses, he hoped they would put their hands in their pockets, and stated that the assessment this year for the expenses of the Convention would be three dollars on each member present—that would cover the whole ground. A voice—"We'll do it."

Dr. Rogers thought the assessment should be on all the members, and not only on those present.

Dr. Ambler, of New York, hoped a committee would be appointed, not only on the publication of the address, but to endorse its principles. (Applause.) After some further discussion,

Dr. Rogers read the resolution as amended as follows:

Resolved, That the thanks of the Convention be tendered to Dr. Townsend for his very able and interesting paper, and that a Committee be appointed to take the whole subject into consideration and to recommend such action as may be thought expedient, with reference to the address and the subject of it.

The resolution was carried, and Drs. Taylor, Ballard and Clark, appointed such committee. Dr. Rogers having requested to be excused.

A vote of thanks was then passed to Dr. Watt for the able and interesting paper read by him in the morning.

Membership.—On motion of Dr. Ballard the following resolution was adopted:

Resolved, That this Convention shall consist of all practicing dentists who may desire to take part in its proceedings; and

that any clause in the constitution conflicting with this resolution be and hereby is repealed.

Diseased Dentine.—The Convention then resumed the subject of the "pathological condition of dentine and its remedial agents."

Dr. TAYLOR, of Cincinnati, considered that he had benefited by the discussion, and that he could congratulate himself that he had been profited by his journey from the west to attend this Convention. As regards the subject under discussion, he had felt the same difficulty that was suggested by Dr. Clark—he wanted information in regard to the treatment which would save the life of the teeth. For instance, there were teeth in which the decay had almost reached the nerve, so that many would suppose that the nerve was actually reached by it. It was important to know whether the nerve was really exposed before they attempted to operate. The mere fact that very cold water taken into the mouth produced pain, was not a diagnosis that the nerve was exposed, or was in a state requiring to be destroyed. He had repeatedly had patients come into his office, saying that such and such a dentist had refused to operate upon a cavity because the nerve was exposed. He took the ground that whenever by introducing the instrument around under the enamel, they could find sensibility, the nerve was not utterly exposed; there was always in that condition a lamina of bone protecting the pulp, which, if it could be saved by the application of any remedial agent, would preserve the vitality of the tooth. And here the question would present itself, is the dentine in such a state of inflammation as to require the dissolution of the parts, or is it in a state of exalted sensibility? The idea of the blood getting into the dentine was hardly to be entertained, but there certainly was increased circulation. Now he contended that increased circulation was necessary for the proper deposition of bony matter, for the ultimate protection of the pulp. Hence if any remedy could be applied to arrest the decomposition, the tooth might be saved.

The next thing to be considered was, what agents are indicated by which they might accomplish this result? And here he would say that the essay by Dr. Watt closely covered this

ground. He had pointed out in that essay certain agents which formed insoluble compounds by which the progress of the disease might be checked until nature had an opportunity to restore the parts to a healthy condition. Upon those remedial agents he (Dr. T.) had predicated his treatment, and he had preserved week after week, and sometimes month after month, in order to preserve the life of the teeth. Great patience and perseverance was required in those cases. He regarded the consideration of these insoluble compounds as an important one. They should be such as not to destroy the dentine itself, and this was the reason why he used in all such cases, tannin and creosote, instead of a chlorine preparation.

In regard to this tender condition of the dentine, he had but one remark to make, and that was, that it would often be found that the patients did not properly control their diet during the treatment. He thought a great deal of difficulty in practice arose from patients not observing a proper diet, by refraining from vinegar and other acids.

Dr. C. A. Harris, of Baltimore, (Dr. Neall in the chair,) said that the question before the Convention for discussion was, the pathological conditions of dentine, and their remedial indications. Only two of these conditions had as yet been noticed. The first was that peculiar structural alteration, denominated caries, consisting as is generally believed, in a chemical decomposition of the earthy salts, and partial or complete disorganization of the animal framework of the affected part. This was one of the pathological conditions that had been discussed. The other was exalted sensibility of the dentine, usually termed inflammation. The first of these conditions was the result of the direct action of chemical agents, although it was contended by some writers that inflammation was necessary, and that inflammation and death of the affected part preceded the action of the chemical agents, which produced the structural alteration. That this opinion was incorrect was demonstrated by the fact that long after the decomposition of the earthy salts, sensibility remained in the animal framework, so that, if touched with an instrument, the keenest pang of pain was oftentimes produced,

and yet the action of chemical agents had been going on until the earthy salts were completely removed. So then, it appeared obvious that the disease, or structural alteration was wholly the result of the action of chemical agents.

Where do these agents come from? Were they generated spontaneously in the mouth, or were they eliminated from the remains of particles of alimentary substances lodged in the interstices of the teeth? Doubtless from both sources. According to the tables of elective affinity there were only four acids capable of producing such effects upon the teeth, or in other words which precede the action of phosphoric acid, in their affinity for the lime which constitute the chief part of the solid ingredients entering into the composition of dentine. But it was well known to dentists and others that all the acids, both vegetable and mineral, did act upon the teeth, but not in the same way. There were only four, perhaps, that were capable of acting chemically, but others, as the muriatic, act as solvents.

The other pathological condition consisted merely in exalted sensibility or inflammation, as it had been oftentimes called, and perhaps very properly, although they might not find all the phenomena present characterizing the disease as exhibited in other parts of the body. This exalted sensibility might depend upon a great variety of circumstances, possibly upon mere constitutional idiosyncrasy, or temperament or habit of body, or upon some peculiar physical condition of the tooth itself. That was a point which had never been satisfactorily determined. They found it in teeth of a very dense structure, as well as in teeth of a chalky texture. They found it in persons in the enjoyment of the best constitutional health, and also in persons laboring under disease, so that it was difficult to determine, with any degree of certainty, upon what this peculiar sensibility depended. He would not take upon himself to determine, although it was known that some conditions of the general system were more favorable to the development of this sensibility than others. Dyspeptic patients were peculiarly liable to it.

There were some other pathological conditions of dentine which had been noticed. One was suppuration, although he

believed there was only one example of this upon record. He was disposed to think, from the description which had been given of it, that the writer who had recorded this example was mistaken, and that the earthy salts had been removed by the action of some acid, which had found its way to the part affected, through a fracture in the enamel; the animal framework remaining in a partially disorganized state, the supposed abscess having occurred immediately under the enamel. That was the only example he had found on record.

With regard to the remedial indications of these conditions, it was scarcely necessary for him to say anything, having already in another place, expressed his opinion at considerable length upon the subject; and more especially as so many gentlemen had spoken upon the subject, and had covered very nearly the whole ground. Yet he might be permitted to add a single remark. In that peculiar pathological condition designated exalted sensibility or inflammation, it was often the case that when the caries had extended only half way from the peripheral surface to the central chamber of the tooth, the painful impressions conveyed through the conducting medium of gold, when the tooth was filled, was such as to give rise to irritation and inflammation of the pulp, which had been known in numerous instances to result in suppuration. He had always succeeded in preventing this painful impression, by the interposition of some non-conductor between the gold and the floor of the cavity in the tooth. Sometimes he had filled the cavity completely with a non-conductor, and permitted it to remain for some weeks or months, when, upon removing it, he had been enabled to fill the tooth without any further apprehension. And in many cases where the nerve was actually exposed, nature employed means to prevent injury by the exudation of coagulable lymph and the formation of callous and osseous structure, very analogous to osteodentine or bone. He had several specimens sent to him by members of the profession, in which the entire pulp was converted into this substance.

The Convention then took a recess till 4 o'clock, P. M.

Afternoon Session.—On motion of Dr. Taft, the business

committee was retained in office till next year, and was requested in the mean time, to prepare the business.

On motion of the same gentleman, the Convention resolved to close the discussion of the present subject at 5 o'clock.

Dr. Clark, of New Orleans, wished to settle the use of a term that had been used a great deal during the morning session, and that was "inflammation." He wished to inquire whether inflammation could be considered as anything else primarily than an increased circulation, and whether the other phenomena were not results of that.

The President, (Dr. Harris,) stated that that question had never been very satisfactorily decided by writers upon pathology. There was a great deal of diversity of opinion upon the subject. Inflammation, no doubt, does sometimes occur without tumefaction—all the other phenomena being present. But still as a general thing there is congestion, as well as an increase of vascular action in the affected part. He did not feel prepared to attempt a definition or explanation of a subject about which there still remained so much difference of opinion.

Dr. Watt remarked that inflammation was something more than increased circulation. There was increased circulation in the act of blushing, but no inflammation. In congestive fevers there was an increased amount of blood in the parts, but that was not inflammation.

Dr. Clark, of New Orleans, said the question was whether the word inflammation could be properly used where increased circulation only was present. There was no redness in the dentine; the red corpuscles of the blood did not ramify it; but there was sensitiveness indicating an abnormal state. He thought it was pretty clearly settled by writers that increased circulation could exist where there was no blood, but other fluid.

Dr. Munson, of Washington, thought that in inflammation the gelatinous portions of the blood stopped the free circulation of the red globules, and inflammation was the result.

The President considered this a very difficult question to pronounce positively upon.

Dr. McQuillen, of Philadelphia, considered it not altogether

a matter of tweedle-dum and tweedle-dee what term was used, as some gentlemen seemed to supposed. He repeated what he had remarked before, that there was but one of the phenomena present in diseased dentine, showing conclusively that the term inflammation was incorrectly applied. He might place his body in contact with fire and get it very warm, but that was not inflammation. None of them ever saw suppuration of the dentine, and dental caries was regarded by few as mortification, but rather as chemical decomposition.

Dr. Watt had suggested the use of nitrate of silver for this disease. He himself regarded it as a hazardous practice, likely to produce discoloration of the teeth. He had never used it on living teeth, but had found it to produce discoloration on dead teeth. He had seen a case to-day of a permanent discoloration of the skin produced by administering nitrate of silver for epilepsy.

Dr. Watt said that the application of nitrate of silver to any osseous tissue destroyed to a certain depth the vitality—the surface was destroyed and there was nothing more to be apprehended. But it was quite different when taken internally, the oxygen being deposited in the skin.

Dr. Clark, of New York, had been in the habit of using nitrate of silver to reduce sensitiveness of the dentine for more than twenty years; in fact, the first effort he ever made was with that substance, and he had applied it a thousand times since. He let the nitrate discolor as much as it would and then scraped it out clean, and had never discovered a stain afterwards. He supposed that every dentist used it. He had also found advantage in making a temporary filling of tin or lead, letting it remain for a few weeks, when he found he could excavate much closer. By letting it remain six months he had made some of his finest operations in cases in which he could not have kept the patient quiet enough for a filling of gold at first.

Dr. Taylor begged leave to make a remark or two upon this subject of inflammation. Perhaps no two subjects had troubled pathologists more than those of fever and inflammation. They all knew that sometimes both the conditions of inflammation were absent. In acute inflammation increased circulation, no

doubt, was the first, primary result, and yet congestion took place shortly afterwards and then diminished circulation. He accepted the definition of Professor Arthur, viz. An altered state of the circulation with an increase of nervous sensibility. The question then naturally arises, is there an altered circulation in dentine? If so, it followed that with exalted sensibility there was inflammation. The question of the presence of red blood has nothing to do with the definition, in his opinion. If there was increased vitality, circulation, and sensibility, he thought the term was as well applied, and as well defined, as the word "tissue." It was difficult to define caries; in it was presented some of the actual conditions of mortification and also of gangrene. Caries was an altered, diseased condition of the dentine with the death of the part. Sometimes they had seen caries progressing to a certain point and then becoming checked. Sometimes the softened part was either worn away or thrown off and got rid of, and there was left a hard glossy substance. Now he doubted whether denudition or abrasion could be considered caries: according to his idea caries was an altered, softened condition of the parts where the circulation had been arrested, producing an altered condition of the component parts of the tooth itself.

Dr. S. P. Miller, of Worcester, said he had used tannic acid alone and in combination with morphine to relieve sensibility. He had sometimes applied it two or three times where the nerve was exposed and then put on a covering and filled the tooth, and he had yet to learn of any ill consequence arising from it. He had also used a composition of five parts arsenic, ten of tannin, and ten of morphine to destroy nerves, leaving it in twenty-four hours for superficial caries. This he supposed they would call malpractice, but he had been successful in applying it to his own teeth as well as those of others.

Dr. Taylor said this reminded him that Dr. Miller had promised to report a case, he would like to hear it now.

Dr. Miller said he had stated a case to Dr. Taylor, in which he had applied arsenic to his left canine tooth and thought he got along very successfully with it. It so happened, however, that the next day after the conversation with Dr. Taylor, it be-

came very tender so that he could scarcely bear the touch of his tongue to it. He let it go on and at length it commenced getting better, and finally absorption took place, and now it was no longer sensitive—but he could eat with it and it would bear as hard a knock as the one on the other side. But he confessed that he would not try such an experiment on a patient. What he did was this: He told his student to apply arsenic as he could not bear the application of the instrument. Two or three applications were made. Having to leave town for several days, he carried the arsenic in the tooth during the time he was away. If he had made only one application and attended to it properly he thought he should not have had the trouble he did. He had a constitutional trouble about the teeth, having lost five or six of his lower front teeth by absorption, therefore, he did not think his own case a proper test. He had used arsenic for several families with admirable effect. In one of these families he had treated a superior molar of a boy with morphine and tannin some two months, and then filled it. It was last fall. During the winter he found the tooth as sensible in the lower part as if he had never exposed the nerve, and he had had no trouble with it since.

Dr. Townsend, of Philadelphia,—the gentleman admits then that he has destroyed the vitality of his own tooth?

Dr. Miller.—I do not; it is sensitive to-day to cold and hot water and to the scratch of his finger-nail. It is my purpose to have it bored to see, and I will report upon it hereafter.

Dr. Spencer Roberts, of Philadelphia, said he had applied caustic potash as successfully as most things. Like arsenic it produced inflammation but it passed off with less difficulty. In almost every person they would find at least one or two sensitive teeth. After excavating, he took some ground feldspar and with a piece of soft orange wood, he rubbed around the cavity two or three times to reduce the sensibility. He used chloride of zinc also, as well as caustic potash.

Dr. Austen, of Baltimore, being invited to say something upon the subject, begged leave to decline as he was not now engaged in the practice of this department of dentistry.

Dr. Munson, of Washington, had used tannin and morphine as his main remedy. He had such bad luck with arsenic that he abandoned it very early; he thought it was absorbed into the body of the tooth and killed the nerve. He wet tannin and morphine with cold water, and then prepared a solution of gum sandarach in alcohol, about the consistence of cream. Sometimes he first put into the bottom of the cavity a plug of asbestos, and applied the tannin and morphine on top of it, putting in a pledget of cotton wet in a solution of gum sandarach and alcohol, sealing it up and leaving it a number of days. If the tooth was still tender he made the application again. In that way he had usually succeeded in alleviating the pain.

Dr. Dwinelle said, many hypotheses had been suggested—he would like to suggest his. The dentine, as he had already stated, was ramified with tubuli, running at right angles, whose extremities reached out to the enamel, terminating in infinitisimal points. The other extremities opened into the nerve cavity like pipes out of a wall. There was the largest diameter of the tubuli. These tubuli were in all probability filled with some subtile fluid which was a medium for the transmission of sensation throughout the dentine. They were so small that the blood corpuscles could not flow through them. The nerve is encompassed with a sack, and has in conjunction a vein and artery forming a complete circulation, so that if the tooth is ever injected by hydrostatic force, it must be by this investing membrane being injected. Now this increased sensibility of the dentine was found universally to be accompanied by an exalted condition of the nerve, together with a general exaltation of the entire system toward the sensitiveness. This being the case it seemed to him easy to account for the sensitiveness of the dentine without a circulation, strictly speaking, in the tubuli. An exalted condition of the nerve of the tooth implied an injected condition—a superior hydrostatic condition, so to speak, charging more fully than usually the whole tubular structure. This fluid must of necessity, be exceedingly subtile, like galvanism, magnetism, electricity or the neuratic fluid. It was the vital principle which converted life with these gross bodies.

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BEST PREPARATION OF GOLD FOR FILLING.

Dr. Rich begged the indulgence of the Convention while he corrected an error in the report of the proceedings of the Convention at its meeting last year, as given in the *Dental News Letter.* The subject of conversation being the preparation of cylinders. He was reported thus :—

"Dr. Rich remarked that his preceptor in this country, Dr. Park, taught him to prepare his gold in cylinders, and formed them by rolling the gold over a watch-spring; he then went on to give the method of introducing the gold, describing a plan of forming an open coil of gold, the interstices of which were filled with cylinders."

That report is incorrect. I said that in the early part of my practice in this city, I had used gold in the form of cylinders or rolls, as they were then styled, and that they were formed by rolling a ribbon of folded gold over a five sided watchmaker's brooch, that the gold so rolled was placed in the cavity endwise, so that it projected some distance out of it, and each roll was packed solid against the wall of the cavity before the next one was introduced. This I stated I had been taught by one of my preceptors, Dr. Park, who filled teeth exclusively by that method, but that I, after using gold in this form for several years, had abandoned it, as being an unsatisfactory method to me. I also stated that while I was using gold in this form, I had originated a method of filling in cases where the cavity had but two or three walls, which method was, to fold a ribbon of gold of such thickness that it would be quite stiff, and of such width that it would project out of the cavity when introduced edgewise. This ribbon was then formed into an open or loose coil resembling in form the main spring of a watch as it comes from the manufacturer. It was then introducec into the cavity edgewise, and opened or unwound until it touched every part of the walls, the interstices were then made as regular as possible, and filled with rolls, made as before described, the coil serving as a frame to keep the rolls in place while they were being packed.

Dr. Gunning, of New York, suggested that it would be better to take up the subject in the morning.

The Chair thought it a pity to lose the time, and Dr. Townsend also hoped the new subject would commence.

It was suggested that each member in order would speak, but as several declined,

Dr. Beale, of Philadelphia, said he hoped that the members who were now prepared, would be permitted to go on, and let those who were unwilling to speak, wait till to-morrow, when they would be better prepared.

Dr. Dwinelle said that gold foil had accomplished more for dentistry than any other auxiliary. But all things considered, he was now convinced that the best preparation was pure gold in a crystalline condition, and he founded his declaration on some little experience. While in Europe a few years ago he had tried several preparations of sponge gold; but that was in an amorphous or unorganized state, and impracticable for filling, while this crystalline gold was highly organized. Soon after returning to this country, he fell in with Dr. Watts, of Utica, who was pursuing a course of experiments in producing the article that he had now perfected, and was all that any one could desire. He (Dr. D.) had acted in concert with Dr. Watts, who had spent thousands of dollars in experiments, supported by his devotion to the interests of the profession, and his honest conviction of the superiority of the article. It was superior to foil in some instances, because it was a more plastic article, more capable of being modeled and built up into desired forms. It could be worked with great facility, and made absolutely solid. This was no mere theory, for he had demonstrated it. He had made fillings of crystalline gold, and after they had been worn in the mouth eighteen months he had taken them out, sent the gold to an analytical chemist to ascertain their specific gravity, and found it equal to that of molten gold. None of his crystalline fillings had disentegrated or absorbed the fluids of the mouth; they were as good and as solid as the day they were first put in, and he expected them to stand fifty years hence, if the patient should live so long. He claimed to do with this article all and more than could be done with foil.

Dr. Townsend, of Philadelphia, said he had worked with foil, for the last twenty-five years he believed like Dr. Dwinelle. He believed a great many operations could be as well performed with gold foil as with crystalline gold. His friend said that a tooth could be built up into almost any desired shape with crystal gold; so it could with gold foil. The Vice-President (Dr. Neall,) had, at this moment, two fillings in his inferior molar teeth which he (Dr. T.) inserted ten or eleven years ago, built up so as to antagonize with his upper ones. He built up the gold, one piece on top of another, welding it on until it was higher than he wanted it. One of these teeth had been in constant use for mastication ever since, and there they both were standing up like two cones. And this was no remarkable case. A year and a half ago he had, with gold foil, built up the crowns of two teeth with no wall around them, and they had been used for mastication ever since.

And now for his experience in the use of crystal gold. Three years ago he was induced to try it as something with which he could do unheard of things. He experimented several days on it with his fingers to get at the method of manipulating. In the first difficult case he had after that, he used the article, and was perfectly delighted with his success. He went on using it several months, when his patients began to come back. He noted all their cases in a book, and he found the edges of the filling breaking away and disentegration going on. Sometimes the gold had entirely disappeared, and in others he had to take it out. And to make the story short, the two ounces that he had used, to his best knowledge and belief, was all taken out, at least he hoped so, for he felt it his duty as an honest man to refill them with gold foil.

After that a better article, so called, was offered, and he made some experiments with that, with a great deal of care, thinking that the defect in his previous work was owing to his bad manipulation. He spent two hours and a half, where he usually spent one on a foil filling. Some of these, so far as he could judge, seemed to have been successful, but his past failures made him afraid of them, and so he took them out. Some

were perfect on the outside, but he found caries going on beneath the plug at the margin of the gum. From this want of success he abandoned crystal gold.

Again, on coming to New York, one of his friends who was an ardent admirer of crystal gold, wanted to show him his method of using it. That gentleman accordingly visited him at Philadelphia, bringing with him a newer article, and they spent one whole morning together packing the gold into a tooth which was held in their fingers. His friend pronounced it a perfectly solid filling, equal to molten gold. The next day he took his plugging forceps and with very little pressure pierced it nearly to the bottom of the cavity, and on examining it with the magnifying glass, he found a break around the margin just underneath the crust. Here was a filling put in under the best of circumstances, and packed in with all the force their arms could exert, and it was not solid. After that, he never had the confidence to try the article.

Dr. J. B. Rich said, that as he was the person who packed the filling referred to by Dr. Townsend, it was proper that he should reply at this time to the statements just made, as the case was unfairly stated. In the first place, the filling was not put in the cavity under favorable circumstances; and instead of a whole morning, there was not more than an hour and a half spent upon it, including the talking and explanations, although it was a large cavity in the antagonizing surface of a molar. Dr. Townsend with his fingers only, held the tooth upright upon the arm of his operating chair, so that it was impossible to prevent its having more or less motion. He (Dr. R.) inserted the filling while the tooth was thus held, with instruments that were imperfect, they being mere pieces of wire without handles, which he had taken there to show the points he used, and his mode of packing this kind of gold, but they were not at all suitable to pack the gold hard, they could not be held firm enough in the hand to exert any force with them. And he recollected distinctly stating to Dr. Townsend that that experiment was not intended as an illustration of the degree of density that could be attained, as the tooth could not be held steadily enough for

that purpose. As relates to the Dr. piercing the filling with the plugging forceps, that fact does not amount to anything, as there was no attempt made to render it a dense one, the principal object being to show the adhesiveness of this form of gold. The crust that Dr. Townsend speaks of as having pierced through, was produced by burnishing the surface, not by packing. He had stated the circumstance exactly as it occurred, and he would leave it to the judgment of even the most prejudiced, to decide if this was a fair experiment. He would insist, moreover, that it was not only unjust, but unbecoming in those who have any pretensions to scientific attainments, to pronounce crystal gold inferior to gold foil, upon the strength of the imperfect experiments they have made with it. If we question those closely who pronounce against crystal gold, we find that they have done so after a few trials, made generally with instruments of a different pattern from those they are accustomed to use, and before they have acquired any skill or practice in the manipulation of this form of gold. And this too, after they have been told over and over again, by those who claim to have used it successfully, that from the peculiar mode of manipulation, it is necessary to follow, in packing it; a considerable amount of education and practice is absolutely necessary before any success can be obtained. No person would pretend to have learned to make good fillings with foil in as short a time as these gentleman have spent in their experiments with crystal gold. He (Dr. R.) would aver that crystal gold could be packed in the mouth as solid as a piece of gold plate. It had been done again and again. And the margin and every part of the filling can in all cases be made as firm and solid as they can possibly be made when formed of foil, and with a less amount of pressure. And when one has become skilled in its use, there are many cases where it can be packed with much greater facility than foil. By pressure applied with an ordinary filling instrument it had been made to enter into the very substance of the dentine, so that when portions of the bone were broken away from the filling, the gold adhered to it, and upon its being submitted to the microscope, the dentine

presented an appearance similar to a piece of quartz, with particles of gold in it; the gold being actually imbedded in the tubuli of the dentine. Now who will pretend to say that a filling put in a cavity in the manner that that was, could be permeated by any fluid. In some of the cavities he had filled, as experiments, he had broken portions of the tooth away from the fillings, and upon examining the surface of the gold so exposed, he found that it had received as perfect and sharp an impression of the walls of the cavity, as could have been taken by either gutta percha or sulphur. This is more than can be claimed for foil, and shows how utterly impossible it would be for fluids to penetrate between the filling and the wall of the cavity, when the gold is properly packed.

Many persons, in making experiments with this gold, have used instruments entirely different in shape from those they use in packing foil,—this is one of the causes of their failure. The only change necessary to be made is in the points of the instruments, which, for crystal gold, requires to be dentated, so as to present a surface of sharp points. Another cause of failure is the attempt to use this gold in difficult cases before having acquired skill in its use. Let those who wish to experiment with it, confine their effort to plain, simple cases, until they have become thoroughly acquainted with its peculiarities, then let them try it in the difficult cases. He (Dr. Rich) had used it exclusively for the last thirteen months, and his good opinion of it increased every day.

Dr. Ballard inquired of Dr. Townsend, how much crystalline gold he had used in all, in the mouth.

Dr. Townsend said about two ounces.

Dr. Ballard asked the same question of Dr. Dwinelle.

Dr. Dwinelle had used it exclusively for two years, and nearly so for three years. He could say he had used pounds of it. He had sometimes used an eighth of an ounce a day.

Dr. Townsend said he had not intended in the remarks he made, to object to any gentleman's using the article; in fact he would be glad to use it himself, if he could produce better results, even if it cost him more time. He was open to conviction, and success would afford him great pleasure.

Dr. Ballard asked Dr. Rich how much he had used.

Dr. Rich replied, some five or six ounces.

Dr. S. A. Main, of New York, remarked, that in 1850, he made some crystalline gold for an experiment. He failed to get it perfected, nor had he seen any up to the present day that was perfect. The same trouble that he found then he had found since. He had found two evils to arise from its use: first, while the outer surface of the filling with sponge gold was most beautiful, upon splitting or sawing the filling into two, the inner surface was quite different; and second, he had never been able to pack it so as to make an even joining surface with the sharp edges of the cavity. He wished any one to tell him if he could pack a piece of crystal gold into indentations made with a file, in hard gold; or if he could exhibit an instrument with which it could be packed into every corner of the cavity as they could pack gold foil. He could make crystal gold with nitro-muriatic acid, but it was a mistake to suppose that it was pure; if any one had succeeded in making it pure, he would say, bless the man who did it.

Dr. Dwinelle said that Dr. Main's remarks did not apply to crystal gold, as now manufactured, but to another quite different article formed by its being dissolved in muriatic acid and then precipitated, a process discovered by Dr. Jackson, of Boston, who experimented a number of years with it. That had been discarded as worthless, and the article now manufactured by an entirely different process contained 999 and a fraction part of pure gold out of a 1000.

Dr. Townsend remarked that the very article which he first used, and which was afterwards condemned, was assayed at the mint in Philadelphia, and found to contain $999\frac{8}{10}$ parts of pure gold out of 1000.

Dr. Dwinelle said it was not condemned for its impurity, but on account of the imperfect manner in which it was manufactured.

Dr. Allport said he had received a letter from Dr. Watts some days ago, in which he authorized him to offer $100 to any dentist who would take his present crystal gold, and put it

through a chemical test, and detect the least trace of muriatic acid in it.

Dr. Ballard had seen the article made from gold coin, and he could assure the Convention, that no mercury or other metal was used in its manufacture, which at present was kept a secret. He only wished he could state more facts concerning it.

Dr. Dwinelle wished to dispose of the muriatic acid, Dr. Ballard having disposed of the mercury. Before the article was completed for the market, it was placed in long cylinders of glass, where it was washed with distilled water until the severest chemical tests indicated that there was not a particle of acid in gallons of the water, when, to make assurances doubly sure, a stream of water was turned on, and allowed to pass through it for twenty-four hours.

On motion, the Convention then adjourned till 9 o'clock to-morrow.

THIRD DAY.—MORNING SESSION.

The Convention met at 9 o'clock.

Dr. Taft moved to close the discussion on "the best preparation of gold for filling teeth," at twelve o'clock, which was carried.

Dr. Dixon, of Pottsville, remarked that the impression left on his mind by the discussion last evening, was this: That those who had been in the habit for years of using gold foil could make a better filling with it than they could with crystalline gold, while those who had used the crystalline gold to a great extent could make the best fillings with that. He objected to the shifting from one substance to another by the profession at large, in order to arrive at conclusions as to the best preparation for filling teeth. Was it not better to leave the experimenting to those who had turned their attention exclusively to some particular preparation. He must confess that, so far as the use of crystalline gold was concerned, he had a very limited experience. He preferred foil, but thought any dentist could do best by using the preparation to which he was most accustomed. He had seen gold foil fillings which could not be ex-

celled, and instanced one that came under his notice, done by Dr. Townsend. It became necessary to take it out, and he found it as hard as amalgam. It was difficult to prevent fillings from becoming moist, but a good filling could be made with foil, even if it does become a little damp.

Dr. W. B. Roberts, of New York, said that there were radicals in the dental profession, as well as in politics. He had tried everything for filling, and he had found that in some cases, sponge or crystalline gold could be used where foil could not be used as well, while in other cases foil was best adapted. He practiced on the eclectic principle in this respect.

Dr. C. A. Kingsbury, of Mt. Holly, N. J., knew of only two preparations of gold for filling teeth, in the form of foil and sponge gold. The question ought more properly to read, which was the best of the two? Both preparations were good. He had been using gold in the form of foil for seventeen years. The crystal gold used at present was very different from the sponge gold first used by the profession. He had seen many cases of operations by dentists who had filled teeth with sponge gold, and he found that a large number of them had proved an entire failure. After being in the teeth a few months, he had found this sponge gold in a very porous and disintegrated state, and he had often found it necessary in these cases, for the preservation of the teeth, to remove the fillings and refill them with gold foil. Most excellent fillings could be made, however, with the crystal gold now used. He had used over an ounce of it making some fillings that gave him satisfaction. He thought there was a disposition to ascribe too much to one article to the exclusion of the other; it was yet to be decided, he thought, which was the best of the two.

He differed from Dr. Dixon in relation to experimenting. In the language of Liebig, nature speaks to us in a peculiar language; she answers at all times the questions we put to her, and such questions are experiments. An experiment is the expression of a thought; we are near the truth when the phenomena elicited by the experiment are corresponding to it, and when the reverse is the result, we may take it for granted that the ques-

tion is falsely stated and the conception founded in error. He believed thorough experimenting was the only course to arrive at truth.

Dr. DIXON said that in speaking of experiment, he meant to refer to that flood of experiment which some seemed disposed to indulge in. He was glad to see these experiments made in a proper way, and hoped they would be continued.

Dr. T. L. BUCKINGHAM, of Philadelphia, suggested that he would like to hear some one tell how to use crystalline gold. There were annealed gold, cylinders, pellets, ropes, and ribbons, each requiring a peculiar manipulation. They had been told that sponge gold was the very best article, but no one had given them a description of the manner in which to use it. He must confess that he had failed, in most cases, in attempting to use it.

It was said that it could be welded together and made perfectly solid. What was meant by the term solid? It was applied to metals to indicate a peculiar cohesive, crystalline structure. It was no evidence because you had the largest amount of matter in a given bulk that the particles were cohesive. Ice occupies a larger space than water, but is much more cohesive? We know nothing about the nature of cohesive attraction except the effects produced. Certain metals in a pure state were capable of being welded without heat. Could they weld particles of gold so as to become perfectly hard and cohesive? Wet clay could be compressed so as to have more material in the same bulk than was contained in a burnt brick, and yet the clay was held together by mechanical adhesion, and the brick by cohesive attraction. This was mere theory, but it deserved attention, for in applying this sponge gold in his own practice, though the fillings appeared to be solid, they had broken down and washed away like clay. Were not the particles therefore held together by the same force as pressed clay? Did it not require vitrefaction or fusion to make the gold solid? The process of annealing was done by means of a high temperature; might not the heat cause a change in the arrangement of the particles by which the attraction of cohesion was increased?

Even at a low temperature, gold by rolling was rendered stiff and hard; heated in the fire and it became soft again. His own opinion was that they could not weld crystalline gold by the process of filling. He had seen fillings of this material where the surface was not burnished, absorb repeatedly drops of moisture. He believed he had not been deceived in that experiment. If that was so, would not moisture penetrate the whole lump and break it up? It was possible that it might be held together by the interlocking of the crystalline particles of gold, the same as gold foil when packed into a cavity.

Dr. C. S. Weeks, of Bedford, N. Y., had used crystalline gold but little. His first attempt three years ago with sponge gold was a total failure. About a year since he began to use the new crystalline gold, and after several unsuccessful attempts he at last succeeded in some kinds of cavities. He found great difficulty in keeping some cavities dry, but where they were shallow and easily accessible, he could make a better filling than with foil, while with deep cavities not easily got at, he could succeed better with foil.

Dr. Austen, of Baltimore, said that if a crystalline gold filling when subjected to the test was malleable and ductile, it was therefore held together by an equally powerful force with that called cohesion, and it mattered not whether it was actual cohesive attraction or not. If crystal gold could be made as compact as coin it was a new discovery. He did not regard the illustration of the burnt brick and compressed clay as hardly in point. Before going into the fire the elementary substances were in a state very different from what they were on coming out; the silica and alumina became a new chemical compound which possessed cohesive attraction. Reduce that brick to powder, and it was no longer cohesive, or capable of as much cohesion as the clay—in fact, it was not clay, it was brick dust. If a plug of crystalline gold could be rolled out into a thin plate and drawn into wire, and having the same specific gravity, it followed that it was as solid as coin. Because metals needed annealing, it did not follow that they were not as solid as before. There was some mysterious agency in heat, but he could not see

how a crystal gold plug differed essentially from molten gold, if the specific gravity was the same.

Dr. A. Merritt Assay, of Philadelphia, gave an account of some experiments made by him, corroborating the remarks of the last speaker, and showing that crystallized gold became solidified in the cavity. He had tested a filling made with sponge gold by the hammer and rollers making it into a very thin plate. He happened to have that specimen in his pocket-book, which he exhibited to the Convention. He had used probably some six ounces of sponge gold and had yet to see the first discoloration of a tooth. He had used it in cavities where without it he was sure he would have been obliged either to use amalgam or extract the tooth. He intended to use it more freely hereafter. No more difficulty attended the use of it than in the case of gold foil. Great care in either case was required to keep the cavity dry; a wet filling of sponge gold would in time peel off or crumble just as a wet filling of foil would do. Instead of using the sponge gold in little round pieces, he thought it should be applied in flat pieces and packed with an instrument much finer than those made by the manufacturers. He ground his instruments off and serrated them to suit himself.

Dr. Watt, of Ohio, rose to correct the statement of Dr. Buckingham about the impossibility of welding gold except by heat. Gold was one of the welding metals without heat, as every worker in it knew.

Dr. Rich stated that not only gold, but tin and lead, were weldable when cold.

Dr. George C. White, of New York, said it was but recently that their attention had been called to crystal gold for filling. They knew, on the other hand, that foil had been used from the beginning of dentistry. They had seen what others had done in the use of foil—that fillings had been inserted in the teeth, and had preserved them for generations. On the other hand, fillings had been introduced by other persons, which it had been necessary to renew from year to year, until finally the teeth themselves were destroyed. Two points were necessary to be reached

in filling the teeth: first, thoroughness of operation; and second, skillfulness of manipulation. With these two, any honest man could succeed, either with foil or crystal gold.

Dr. CLARK, of New Orleans, thought that if foil was properly used, and its properties were correctly understood it would accomplish what every honest dentist would desire to accomplish, the preservation of the teeth. He would undertake to build up a five-cent piece into the shape of a thimble by gold foil of even layers and straight, smooth laminæ, with the pressure of five pounds only, applied with a single point, and any gentleman here could do the same. Still he was much interested in sponge gold, thinking it might be a valuable adjunct to foil. They could do wonderful things with foil, but there seem to be properties in sponge gold not possessed by any other material. He could not say that he could do everything with foil that could be done with sponge gold. There were certain properties about the use of well prepared crystal gold that led him to believe that there were cases which could be treated with more facility by its use than gold foil. He related an achievement of Dr. Allport, of Chicago, in restoring the exterior and cutting edge of teeth, which to him was more gratifying to look upon than the productions of a Raphael. The front incisors were separated as if a file had been passed between them a quarter of an inch thick, nearly down to the gum. These teeth had been built up and restored to their original shape, their approximate edges almost touched, and they were perfectly adapted to mastication. They had been used nineteen months. He understood that Dr. Allport used foil in connection with crystalline gold in the same cavities. He intended when he went home to try the article.

Dr. ALLPORT having been solicited to state how he proceeded to fill teeth in such cases as these, said that he generally used crystal gold entirely; yet in many difficult cases, for instance, in building up a tooth where two sides were standing, he used more cylinder than crystal gold. He conceived that foil could not be used in particular cases as successfully as crystal. Miracles almost had been performed with gold foil. He had seen fillings made by Dr. Blakesly, of Utica, thirty-five years

ago, as perfect now as then, so far as the preservation of the teeth was concerned. One great desideratum in all operations was the saving of time; in this respect he did not regard crystals as advantageous as foil. In many cases he could save one-third or one-half the time with foil. He used also pellets for cases where they seemed better adapted. In this respect every one must use his own judgment; the great thing in filling teeth was the exercisc of good sterling common sense. It required more time to learn to use crystal gold, in his judgment than foil. It required months of hard labor to learn to fill a tooth with gold foil properly, and it required more to learn to do it with crystal gold. But when the art of using it was once acquired, more could be accomplished with it than with foil.

It was said that crystal gold fillings would break down, and that the bottom of the cavities would become soft. Last January he had filled a superior canine tooth with crystal gold; the whole of the bone of the tooth was gone, there being nothing left but the enamel, and that so thin, that when excavating the cavity the instrument could be seen through it. This filling was worn until April, when the crown was broken off, by biting upon something hard, and came away in pieces, leaving some fragments of the tooth remaining. He saw that tooth two or three days ago, when he filed the edges where the filling came in contact with the enamel, and polished them. There that plug remained to-day, perfect for all the purposes of mastication. He cited this to show that crystal gold would not crumble, if it even did, it was owing not so much to the gold as to the manner of using it. And here he would remark, that much of Dr. Watt's gold made previous to the last year was bad, and even now he regretted to say, much of it was not what could be desired; though it was said to be all alike, there was a difference from some cause or other. The difference was in the working properties, some would adhere almost instantly, while other portions would not.

Dr. Seabury used more foil than crystalline gold, but in certain cases he knew he could accomplish what he could not with foil. Dr. Allport expressed his experience.

Dr. Arthur, of Philadelphia, had in various times and places borne testimony to sponge gold, and had not yet ever any reason to change his opinion. Any failures in his operations he could attribute to some defect of manipulation or some other circumstance which made it exceediugly difficult to perform a good operation. Though some of the fillings were, after a lapse of time, not perfectly satisfactory in appearance, yet even then, there was no discoloration below the surface, and no diminution of the density of the filling.

But he no longer used sponge gold; its use had led him to the discovery of an entirely different method of operating from what he had previously pursued, and he had since used gold foil in an entirely different manner. He had been told by a number of gentlemen that this was no new thing, that they had been in the habit of depending upon the adhesive quality of gold foil for years. Such had not been the case with him and many others that he knew. A great many manufacturers of gold foil had been led to make an effort to avoid the objection of the want of an adhesive quality, which prevented making a good operation when used in the ordinary way. But he was assured by gentlemen who had worked in gold foil, that it was only necessary to produce a perfectly pure article of gold, to possess without annealing this strong adhesive quality, so that it could be welded together in a solid mass like sponge gold. If therefore gold foil could be made to adhere in the same manner as sponge gold, why could it not be used in the same manner and with the same results? Every manufacturer, he had been told, could make it with this adhesive quality, and it could be used precisely as sponge gold, with the exception that the instrument should be somewhat sharply serrated and somewhat more hardened. It was well known that gold foil, no matter how adhesive in the beginning, in a very short time, if exposed to the atmosphere, would lose this adhesive property. But this change which was confined entirely to the surface, could be entirely removed, and the gold restored to its original condition by subjecting it to a very moderate heat—something short of a red heat—ordinarily called annealing. It was only necessary to

place it upon a plate and hold it over a spirit lamp until the plate becomes hot. In an article published by a prominent writer on electric metallurgy, it was stated that any metal held in a current of air becomes covered with a film of air, and that it is impossible to get a galvanic deposit upon that surface until it is exposed to heat. It could not be a film of moisture because a sheet of paper could be passed into water and removed perfectly dry. He had endeavored to call the attention of the profession to this method of using gold foil, and a number about Philadelphia were now using it to the exclusion of every other, and said that no inducement could bring them back to any other material. Dr. A. referred to an operation performed by Dr. Colwell, where foil was used in an upper molar tooth, with nothing remaining but the interior surface and a small portion of the outer wall, the most beautiful operation he ever saw, which could not be surpassed by the use of crystal gold.

Dr. Miller, of Massachusetts, said that he had some experience in the use of crystal gold, and he regarded it as a very valuable auxiliary to the profession. He had no doubt that this form of gold did possess valuable qualities, for upon that subject, they had been enlightened with the discoveries of men of experience and learning. He had used sponge gold and cylinders in combination, and they worked well together under certain circumstances. He was an eclectic himself, and used the best material at his command adapted to suit the particular case in hand. When a new thing was introduced into the profession he investigated its merits, and adopted whatever he found to be valuable about it. He knew of no other way to perfect success. Life was made up of experiments. If objection was made to experimenting, it would cut off all improvement. His object in the practice of his profession was, to make a thorough examination of all new discoveries in the line of his art, and adopt whatever was practical and valuable.

Dr. Searle, of Springfield, mentioned a case of Dr. Arthur's that came under his notice, where a superior bicuspid with only the outer half of the crown remaining, was built up so that it articulated perfectly with the lower one.

In regard to cylinders, he had used them for twelve years. Dr. Clark had said at Philadelphia, that he was the original discoverer, and he had no doubt he was *an* original discoverer.

Dr. Clark, of New Orleans, said he borrowed the idea from Dr. F. H. Badger, supposing that he used them entirely. Dr. B. would not state how he did it, but he (Dr. C.) went to work to find out, and as he thought discovered it. He shortly afterwards found that Dr. Badger repudiated the idea entirely that teeth could be filled with cylinders alone, saying that he only used them in the center of the cavity. He did not claim any original discovery and never had. What he had learned, he gave freely to the profession, as it was every man's duty to do.

Dr Searle did not himself claim any originality; the idea came to him in 1840, through a student of Dr. Keep, of Boston.

Dr. Hessel, of New York, had not yet seen any better work done with crystal gold than could be done by the same operators with foil. He was one of the earliest to experiment in the use of sponge gold. He manufactured it himself in the most pure manner by means of an electro-galvanic battery; but it was expensive and therefore impracticable. Sponge gold in a pure state was essentially the same as gold foil, and subject to the same conditions. Though it would not change when tested by strong acids, yet in some mouths it would turn black, showing that the fluids of the mouth was a powerful solvent. Gold foil, if rightly and skillfully used, would stand all the tests required.

Dr. McKellops, of St. Louis, had been very unfortunate at first in the use of crystal gold, whether from imperfect manipulation or because the article obtained was imperfect, he could not say. He found that the plugs would change after a lapse of time. The article first used, however, was condemned by Mr. Nichols, of the firm of A. J. Watts & Co., who furnished him with a better article, which so far as he had used it, he found excellent. For large, saucer-shaped cavities with a small margin to hold in the fillings, he had found it very advantageous. It should not be condemned after three or four trials. He had used some five or six ounces of the superior article, and he believed that by the next meeting of this Convention, they would

all be satisfied with it. He was very much pleased however, with Dr. Arthur's method, and was going to Philadelphia to learn it.

Dr. GUNNING, of New York, said that according to the general experience of gentlemen who had used crystal gold, it required a great amount of pressure to make it solid. The density of the filling was a matter of great importance, and it seemed that more labor and time was required upon crystal gold than upon foil. That being the case, though a strong patient of forty years of age might well bear the great amount of pressure requisite with impunity, it would be frightful, perhaps, to a young delicate female. Time, to a person suffering pain, is a matter of some consideration. There were certain fillings which on account of their not being subject to wear, did not require so great density as others; would it be proper in such cases, under an excited condition of the nervous sensibility, to put in a larger quantity of crystal gold, subjecting the patient to great suffering, and running the risk in some cases, perhaps, of ruining the tooth in the socket, when foil could be inserted in less time and with less pressure and pain? The object of the dentist should be, not to see how dense a filling he could make in all cases, but to make a filling which would in all probability outlast the tooth in the socket. He contended that theoretical nicety was not their aim, but to make fillings best adapted to the particular cases. He would not concede that crystal gold was the best article in cases which would not admit of great pressure; and in gold foil, he insisted, that they had an article which they could control, and with it they could, in most cases, fill cavities in such a manner as to perfectly exclude moisture and save the teeth. The foil manufactured was not all equally adhesive, but they could use the more adhesive foil for cavities where the greatest care and nicety was required.

Dr. G. not having completed his remarks, it was moved that the speaker be allowed ten minutes longer.

Dr. BALLARD moved as an amendment, that the discussion continue for the remainder of the morning session.

Dr. CLARK, of Louisiana, opposed the motion, as he wished

some time to be devoted to the exhibition of improvements in instruments.

Dr. Taft moved an amendment to the amendment, by continuing the discussion till one o'clock.

Dr. Searle said there were complaints that the old hackneyed subjects were kept before the Convention, and day after to-morrow would be Sunday.

Dr. Rich moved the previous question, which was carried.

The question being put on the amendments severally, and on the original motion, they were all rejected.

Eight minutes being left of the time allotted to this discussion,

Dr. Flagg, of Philadelphia, obtained the floor, and remarked that, as regards the materials for filling, they knew infinitely more of foil than any other preparation. Work done by such men as Hudson, and many other deceased brethren of the profession, had stood forty, fifty and sixty years, and fillings made twenty-five years ago, could not be told from work done twenty-four hours ago.

As to the method of using foil, it should be so used as to be the most thoroughly condensed, with the least amount of labor. He had been pleased with the remarks of Dr. Arthur.

Dr. Taft moved that this subject be resumed at four o'clock this afternoon. Lost.

THE FEES QUESTION.

Dr. Taylor from the Special Committee, to whom was referred the paper of Dr. Townsend on "Professional Fees," reported that they regarded the subject as one of great importance to the profession, and the views therein expressed, as embodying principles which alone can lead to professional excellence ; and while we would thus commend the whole, we would especially draw the attention of this Convention to that part which treats upon professional counsel and advice. The committee would not pretend to even suggest the amount of compensation which should be charged for any given operation, yet we cannot but recommend that this Convention do express their decided dis-

approbation to all that course of conduct, which so cheapens dental operations, that the good of the patient must be the sacrifice. We entirely disapprove the idea that an intelligent people will not appreciate and pay for the most perfect operations. We offer, therefore, the following resolutions:—

Resolved, That it is the duty of every member of the profession to so charge for his services, that he shall be well paid for all the time and the best skill he can expend on an operation, and which shall be an inducement for further excellence.

Resolved, That the best interests of dental science demand that a fair and liberal fee shall be charged for professional counsel and advice.

Resolved, That our profession, having for its basis true knowledge and skill, we cannot but regard that knowledge which may prevent disease as of equal, yea, more value to our patients than that which may arrest or cure.

The report was adopted unanimously.

Dr. Rich moved that a committee of three be appointed to revise and prepare the report of the proceedings for publication, and to have the revised report and Dr. Townsend's paper published entire, in all the dental journals. Adopted. The Chair appointed Drs. Rich, Maguire and Dwinelle as such committee.

Dr. Van Patten, of Washington, D. C., moved that at five o'clock this evening, the Convention proceed to consider the time and place of the next meeting. Carried.

A notice was then read, inviting the dentists from abroad, to an entertainment, to be given by the dentists of New York and Brooklyn, at Dodworth's Rooms, this evening. The members to meet at Hope Chapel, at 8 o'clock, P. M.

Dr. Clark, of Louisiana, moved that one hour be now devoted to the exhibition of Dental Improvements.

Dr. W. B. Roberts, of New York, exhibited a set of teeth made with continuous gum mounted on platinum.

Dr. Loomis, of Cambridge, Mass., presented a specimen of artificial teeth for which he claimed superiority, dispensing with a metallic plate, and substituting a mineral base, the whole forming a solid piece.

Dr. Wheat, of New Haven, produced a specimen of teeth inserted in hard rubber compound. The hard rubber was perfectly free from any liability to absorption, and it was impossible to break the teeth so inserted, especially the grinders.

Dr. Mallette, of New Haven, presented another specimen, made in a similar way, which he and his partner had, he believed, perfected. There was nothing but mineral teeth and hard rubber used—no metal. He proceeded to describe the method of preparation.

From all that could be gathered by the reporter, it is believed that there is a patent which bars the free use of each of the above improvements; in the two latter cases, however, it is only the use of Goodyear's Vulcanizing Patent that stands in the way.

Dr. Franklin, of Newark, exhibited a fluid lamp adjusted on a balance, with an inverted siphon, running from the cup to the wick. It was so adjusted, that as the fluid became exhausted, the part containing the wick gradually lowered, causing a uniform flow of alcohol. It had also the advantage from the arrangement of the siphon, of being perfectly safe from explosion. When the lamp is not in use, and the cap is put on the wick, then the wick part being the heaviest, it was kept in a horizontal position by a spring underneath.

Dr. Malette exhibited a plate punch so arranged that two holes could be punched at once, corresponding with the pins for the backs in artificial teeth, one punch being movable. It was used for punching two holes in the plates, suited to the pins in the artificial teeth.

Dr. Harris, of Baltimore, exhibited an instrument invented by Dr. Putnam, for producing local anasthesia, very useful for extracting teeth without pain.

Dr. Putnam stated that the agent used was ice and salt, and the instrument was so contrived, that the application could be made to the smallest portion of any external part of the body. The gums were frozen by the application, and consequently the teeth were extracted without pain. Some gentlemen raised an objection to this application, on account of its causing sloughing sores in the gums.

[The reporter here feels it his duty to state, that the report which appeared in the *Express*, concerning this invention, in which it is stated that the Convention adjourned to Dr. Putnam's house to witness the operation is incorrect, and the fact of the report appears under the head of "Afternoon Session," when the explanation was made in the morning, leads to a suspicion that the reporter had some other purpose in view, than to give a true and fair account of the matter, and the subsequent use made of that report, confirms the suspicion.]

Dr. Taft, of Ohio, exhibited a blow-pipe for throwing a warm jet of air into cavities for the purpose of drying them. It consisted in an india-rubber bag, with a metal tube attached, which might be filled with a heated substance that would retain heat well, the air passing through it by pressing on the bag.

There was also exhibited an instrument to enable dentists to get a more perfect articulation of teeth.

The Convention took a recess till 4 o'clock.

AFTERNOON SESSION.

A motion was made and carried, that the Convention resume the consideration of the subject of the best preparation of gold for filling teeth.

Dr. McQuillen said that his experience had not been a successsful one in the use of sponge gold. But gentlemen would say that his experience had been so limited, that he could not arrive at correct conclusions in regard to this matter. He had not arrived at the conclusions he had stated, so much from his own experience, as from the failures of eminent operators. Therefore, he stood forward as a witness in favor of the objections urged against sponge gold, that its use produced discoloration and disintegration of the teeth.

He had tried the plan of annealing, explained by Dr. Arthur, and found that he could not introduce as much gold into a given cavity, as with the ordinary gold foil that he received from Abbey. He believed the annealed gold hardened under the instrument so rapidly as to choke up. There was a point where

they must cease to use the instrument when operating with ordinary gold foil; as there was a point where the painter must lay aside his pencil; otherwise they might get such a temper in the gold that the next gold put in would not adhere. He had reason to infer from his experience in the use of annealed gold, that the specific gravity of a filling was not equal to that of one made with the ordinary foil, judging from the quantity used in the cavity.

Dr. Ballard said that he could speak with some confidence upon this subject, gained by an experience of some years. He had used crystalline gold for three years with great success. He had the pleasure of seeing the first operation that was ever performed with crystalline gold, and it was perfectly successful. The result of his experience could be summed up in a very few words. There was no question that a vast amount of improperly prepared gold had been in the market, imperfectly purified and imperfect in its microscopic structure. He wished only to speak of perfectly made gold, which contained all the requisites that were desirable for a successful operation. Many failures, undoubtedly, had occurred with the very best gold, but his own experience taught him that these failures had been the result of imperfect manipulation. He did not know a man anywhere who did not make a failure sometimes. In a majority of cases occurring in his practice of three years, he had used crystalline gold with success, but there were cases in which it would not answer. He wished to state the following reasons in favor of its use—its exceedingly delicate structure, which enabled the dentist to place it in positions so exposed, that nothing else could be retained there, its perfect purity, and its density.

In regard to porosity of fillings, it was perfectly evident that a perfectly solid filling could not become porous without expanding and disrupting the plug, or splitting the tooth. A porous filling, therefore, must have been left so in the beginning; gold once deprived of its porosity, could not become porous again. The experiment related yesterday, by Dr. Dwinelle, ought to convince any one that a filling of crystal gold could be made perfectly solid.

Dr. Taft considered the method adopted by Dr. Arthur, as a very great advance in the use of gold, and he intended to try it. Leaving that out of view, he preferred in most cases crystal gold to gold foil. There was a confusion of terms in speaking of sponge gold, many applying it to all the preparations that had been made and called by that name, perceiving no difference between the varieties that had been produced. There were three forms in use for filling. Sponge gold he considerd to be simply granulated gold obtained from precipitation; by various methods of precipitation they could get an article with which they could fill deep cavities. Then there was structural or fibrous gold. Then again there was another form in which its crystals were larger and more definitely formed, than in the two previously mentioned. In that variety which had no structural character, but was simply gold in a state of minute division, they had to depend entirely upon its property of cohesion in introducing it into a cavity. This form of sponge gold was not reliable, although occasionally tolerable fillings might be made with it. In the structural or fibrous gold—which might be denominated crystalline—besides the adhesiveness, it was retained in the cavity by the fibres folding upon one another. Again in gold formed of definite crystals, they not only had the cohesion property, but the interlacing of the angles of the crystals to retain the filling in a solid state. In the use of foil well annealed, there was a cohesion doubtless sufficient to retain the particles together; but in the crystalline gold there was besides cohesion, this interlacing of the particles which they did not have in foil. No doubt with sufficiently strong walls they could build up foil into a pyramid as described by Dr. Townsend, but he thought it required much more skill with foil than with crystal gold; and he conceived that there were many cases where crystalline gold could be used where foil could not, as in the case described by Dr. Clark, where one-third of the approximate edges of the incisors are broken away.

The President (Dr. Harris) said that the preservation of the natural teeth was of more importance than the replacement of these organs with artificial substitutes. He rose not so

much to give his own experience in the use of crystalline gold, as the results he had seen from its use by other operators. He had been in the habit of using crystal gold for three or four years. During the first two, the results in his own practice were not as satisfactory as he could have wished, but more recently they had proved so, although he was not yet prepared to lay aside the use of foil. He used three ounces of foil to one of crystalline gold. When he heard doubts expressed by several members of this Convention, with regard to the practicability of of making fillings with crystalline gold of as much value and permanency as those made with foil, he felt it due to the manufacturers of this valuable article to say, that he had seen fillings of this material which had been in the mouth upwards of two years, that were still in a perfect state of preservation, equal, and in some cases, when all the circumstances connected with them were were considered, superior to any operations which could have been made with foil.

A case occurred to him at this moment, of a young lady who formerly resided in this city, who recently came into his office to have her teeth examined. Many of her teeth were made up almost entirely of gold, the crowns of several having been destroyed. In one case, a new crown had been built up with crystalline gold, and although it had been there two years, it was as perfect as any filling could possibly be. There were thirty fillings in all, or more, in the mouth of the patient in question, all made by Dr. Ballard, of crystalline gold, two years ago. An upper molar that had decayed away, so that, if he were not mistaken, the walls were entirely gone with the exception of a small portion which came down below the margin of the gum, was thus built up and answered all the purposes of a natural tooth. He could name other operators, Dr. Dwinelle particularly, who had realized his fullest expectations with regard to this article. He was fully satisfied that there were cases in which this form of gold could be used more advantageously than foil; but on the other hand, he might say the same in favor of foil. It would be difficult for him to say which he regarded as the most valuable, though if he could have but one

he would hold on to foil, having used it so long that he had become upon this subject. something of an "old fogy."

Dr. Rich said, the difficulty of procuring foil that was sufficiently adhesive, even after he had annealed it, had induced him to try the merits of crystal gold. The experiments he had made with it had demonstrated beyond a doubt, that its particles would adhere, it could be made solid, and when solid it was impermeable.

Among the experiments made to ascertain these facts, were the following: Portions of this gold were packed in the cavities of teeth with ordinary instruments that he used every day in his practice. One of the fillings so formed was drawn out into wire, another was rolled into plate, and a third was hammered into plate on the anvil. Another portion that formed a small disc about an eighth of an inch thick, was secured on the end of the tube of an air pump; a drop of water was then placed upon the upper surface of the disc, and the tube exhausted with the full force of the pump, (which was a powerful one,) the water remained upon the surface. The disc was then ground down to about one half its original thickness, and the experiment repeated with the same result. The objection to this gold that it requires more time to consolidate it than is necessary for foil, will not be sustained when it becomes better known. When he first used it, a filling of crystal gold required double the time that he would have spent on one of foil. Now he packed and finished it with as great facility as he did foil, and found it more easy to prepare, of convenient sizes, for introducing into the cavity. In difficult cases, as, for instance, where the filling has to be built up independent of the support of the walls of the cavity, crystal gold can be used with much greater facility than foil. This, is a very important advantage. The improved crystal gold, as manufactured now, by A. J. Watts & Co., did not of itself produce discoloration, it was *pure* gold without the least trace of any other substance, and therefore it could not discolor the teeth.

Several professional friends had told him, that they had cases in their practice, where they had used crystal gold, and it had

produced discoloration; as he (Dr. R.) doubted that the gold had been the cause of that effect, he had requested them, for their mutual satisfaction, to allow him to see the fillings removed, and to examine the cases critically. In several instances they had done so; the fillings were removed, and the gold, and the cavities examined, and in every case it was clearly evident that the fault was not in the gold, but in the manipulation, either in preparing the cavity or in packing the gold, and in every case, it was easy to decide to which of these two causes the failure was to be attributed.

The statement is often made, that the surface part of a crystal gold filling, becomes quite solid and hard, while the rest of it remains soft and porous. When this occurs, it is the fault of the manipulation; if one part of the filling could be made solid, the whole could. The amount of pressure that made the surface dense would have had the same effect upon any other part of the filling, if it had been applied there. The proper method was, to pack the filling solid from the bottom of the cavity, and introduce the gold in small portions, each of which must be made as solid as may be desired, before the portion which is to be packed on top of it is introduced. One of the most valuable properties of crystal gold is, that it can be made of any given degree of density of which gold is susceptible, with much less pressure, than would be necessary to produce the same degree of density in foil. In finishing the surface of the gold, when the cavity is filled, this peculiarity must be borne in mind, and in consolidating and finishing the gold at the margin, great care is necessary to avoid working it too much at that point, for if as much labor was spent upon it, as would be necessary to make the margin of a filling of foil as solid and as hard as it ought to be, the margin of the crystal gold filling would become brittle, and would easily break and crumble up. The same effect would be produced with foil; when it reached the same degree of density, that would also become brittle.

PLACE OF NEXT MEETING.

The Convention then proceeded to appoint the place for the next meeting.

Washington, Boston, Niagara Falls, Saratoga, White Sulphur Springs, (Va.,) Baltimore, Cincinnati and St. Louis, having been severally proposed, the Convention decided, by a division of 56 to 40, that the next meeting shall be held in Boston.

On motion, it was agreed, that when the Convention adjourn, they adjourn to meet at Boston, on the first Tuesday in August, 1857.

LOCAL SOCIETIES.

Dr. Blandy, of Baltimore, offered the following resolution, which was adopted:

Resolved, That this Convention recommend the formation of local or state societies, and that each association thus formed, be requested to send one or more delegates to each meeting of this Convention, thus making our annual convocation emphatically the great central Congress of the dental profession.

CREDIT FOR NEW IMPROVEMENTS.

Dr. Taylor moved the following resolution, which was adopted:

Resolved, That in the opinion of this body, the credit due for new discoveries or useful modes of operating, belongs more to those who have given those improvements to the profession, than to those who pretend to have discovered the same at a previous period.

The following resolution was offered by Dr. Buckingham and adopted:

Resolved, That the Corresponding Secretary request the members of this Convention and others, who have anything new or useful, to present them at the next meeting.

SCALE OF PRICES.

Dr. Shaw, of Philadelphia, moved the following resolution:

Resolved, That a committee of three be appointed to inquire into the expediency of adopting a scale of minimum prices, every practitioner to have the privilege to have a scale of prices of his own, as much higher as he may consider proper, and that

it shall be considered derogatory to the character of any dentist, to go below the scale that may be adopted by the Convention; said committee to report at the next meeting of the Convention.

The resolution was adopted, and the Chair appointed as the committee, Drs. A. R. Shaw, C. W. Ballard, and E. Townsend.

COMMITTEE ON PUBLICATION.

The following resolution, offered by Dr. Bonsall, was adopted:

Resolved, That the committee on the publication of Dr. Townsend's address, be authorized to draw on the Treasurer for the expense of publishing the twelve hundred copies ordered by the Convention.

The following resolution, offered by Dr. Rich, was adopted:

Resolved, That the publishing committee be authorized to draw on the Treasurer for the expense of furnishing stereotype plates of the proceedings of the Convention, and Dr. Townsend's essay, to such of the Dental Journals, as shall publish them entire.

VOTES OF THANKS.

A unanimous vote of thanks was then passed, on motion of Dr. Austen, to the dentists of New York, Brooklyn and Williamsburg, for the courtesies received by the members from abroad, and also, on motion of Dr. Watt, to Messrs. Jones, White & McCurdy, for their excellent entertainment on Thursday evening.

A vote of thanks was then, on motion of Dr. Coates, of Virginia, tendered to the worthy President of the Convention, for the dignity and impartial manner with which he had presided over the deliberations.

The Convention then, on motion, adjourned *sine die.*

SELECTED ARTICLES.

ARTICLE III.

Report of the Meeting of the Western Dental Society at Chicago, Ill., on July 30th, 1856.

PRESENT.—Drs. Allport, I. C. Quinlan, W. H. Kennicott, E. Honsinger, T. P. Abell, E. A. Bogue, Chicago, Ill.; J. S. Clark, S. F. Knapp, New Orleans; C. W. Spaulding, A. Blake, Henry Barron, S. Dunham, H. J. B. McKellops, St. Louis; H. N. Lewis, Quincy, Ill.; A. M. Kelsey, Geneva, Ill.; D. W. Perkins, Rome, N. Y.; H. R. Smith, Terre Haute, Ind.; C. P. Fitch, Hanson, Milwaukie; I. P. Norman, Bockford, Ill.; Anderson, Hannibal, Mo.; Solyman Brown, New York; William Smith, Ottawa, Ill.; A. T. Metcalf, Kalamazoo, Mich.; Mansfield, Niles, Mich.; E. J. E. Carpenter, Joliet; C. J. Reynolds, Dixon, Ill.; A. Gibbs, Chicago, Ill.

In the absence of the President, D. E. Hale, of St. Louis, Dr. Allport, one of the Vice-Presidents was called to the chair.

Dr. Allport said, that in the unexpected absence of the President, he should detain the meeting with but a very few remarks.

A few years had effected a remarkable change in the dental profession. Formerly a knowledge of its more elevated practice was confined to the larger cities. Now the science of dentistry was extended over the whole country, north, south, east and west. This was the normal result of a generous liberality on the part of a few eminent practicioners, who had made known the principles and practice of dentistry to their professional brethren, as well as to students in the art, both privately and by means of periodicals and colleges, established expressly for the purpose, in various parts of the country. The names of

Parmly, Harris, Maynard, Taylor, Townsend, Dwinelle, Solyman Brown, Dunning, Westcott and others, would readily occur in this connection.

In pursuance of the same object, and in imitation of these noble examples, we organized this Society last April, in the Great West, and have new met for mutual instruction and improvement.

It was then, on motion, *Resolved*, that Dr. Solyman Brown, of N. Y., Drs. Clarke and Knapp, N. O., Dr. Perkins, of Rome, N. Y.; and Dr. Smith, of Terre Haute, Ind., (one of the Professors of the Cincinnati College of Dental Surgeons,) be invited to participate in the business of the present meeting.

After reading and approving the minutes of the last meeting, a Committee consisting of Drs. Blake, Dunham and Clark reported as the special business of the session, the following subjects for discussion, viz. The Extraction of the deciduous teeth of children; The Plugging of the fangs of teeth; The use of Gutta-Percha as the basis of artificial teeth; and Crystal Gold.

This judicious selection of subjects was approved by the meeting.

Dr. Clarke opened the discussion on deciduous teeth. He remarked that the subject was one which had been too much neglected by the profession, and yet was one of pre-eminent importance. If deciduous teeth are removed as a general rule, it ought to be by the absorption of the roots in proportion as the permanent teeth advance to supply their place. The use of the first set is to prepare the way for their successors, and to perform the uses of the second set of teeth until the gums are fully developed to receive them.

The wholesale extraction of deciduous teeth, for the purpose of gratifying nurses who dislike the crying of children, or parents who are ignorant of the uses of these organs beyond the mere mastication of food, is a very bad practice. He does not extract the tenth part of those which are presented to him for that purpose.

These teeth preserve the form of the jaws, and unless they become loose by absorption of the roots, and no longer serve

that purpose, as a general rule should never be removed. Nature generally removes them in her own right time, and by means altogether preferable to the forceps of the dentist.

Dr. Kennicott inquired of Dr. Clarke what had been his successes in stopping deciduous teeth.

Dr. Clarke responded that he had never courted success in that line. He called it only *stuffing.*

Dr. Perkins remarked, that the development of the human physical system was harmonious throughout, and simultaneous in all its parts. He described the development of the two successive sets of human teeth. In treating the teeth of children he always regards primarily the welfare of the adult teeth which succeed them. The teeth of children are now developed much earlier in this country than in former years, the probable result of the different habits of society at successive periods.

Dr. Knapp inquired of Dr. Perkins whether he would extract deciduous teeth, when they were decayed to the nerve; and was answered that it would depend somewhat upon circumstances.

Dr. Knapp remarked, that children should be taught to exercise their teeth in the mastication of hard food, which is necessary to their healthy development.

Dr. Clarke remarked that Dr. Knapp had been trying the experiment for four or five years, of brushing his children's teeth morning and evening, with his own hands, not being willing to entrust the experiment to nurses, and that his success in preserving them seemed thus far very perfect.

Dr. Perkins does not allow his children to use vinegar; in consequence of the deleterious effects of all acids except those of the milder forms, such as found in fruits. He does this by way of experiment, as he thinks vinegar injures the tender enamel of children's teeth.

Dr. Dunham inquired whether there is any particular advantage in filling children's teeth, to which Dr. Clarke replied in the negative.

Dr. Allport stated that he had been in the habit of doing so, when it seemed proper. When practicable he files instead of filling. He thinks that the subject of keeping children's teeth

clean is of very great moment; on which point dentists ought to take great pains to instruct the public. Adjourned till 2 P. M.

AFTERNOON SESSION.

The subject of children's teeth was resumed.

Dr. Clarke spoke at some length of the action of acids on the teeth; acids in food; acids in the secretions, and acids generated by foul deposits between and around the teeth.

Dr. Perkins believed that the luxuries of the present age in this country, are destroying teeth with alarming rapidity, by vitriolating the general constitution, as well as by direct action on the teeth.

Dr. Quinlan thinks that the experiments already made show clearly that acid substances injure the teeth.

Dr. Fitch thinks the great question is, what acids the food develops, and what action they have upon the teeth, and believing that the subject had been sufficiently discussed for the present, he suggested that the proper topic for the afternoon's discussion, is, the propriety of filling or plugging the fangs of teeth.

Fang Filling.—Dr. Clarke said that the filling of the fangs of teeth was practiced long before he was in dental practice. Drs. Harwood, Maynard and others, were before him in this department of the art of dentistry. His present confidence in *fang filling* is greater than he had ever anticipated.

The method of operating is to draw the temper from a fine broach and cut barbs like those of a fish-hook, covering one entire side, leaving the other side perfectly smooth. With the smooth side against the side of the orifice, he then thrusts the instrument to the bottom of the nerve cavity to the very foramen of the root; whereupon he quickly rotates the instrument so as to bring its barbed side in contact with the nerve, and then extracts it from the cavity whereby the nerve is removed. The cavity is farther cleaned with small instruments, when it is ready for the filling. In filling the cavity I use one instrument, the temper of which is drawn to the blue, and wrap around it a fold of gold foil, which I thrust to the bottom of the root, and press

to one side of the cavity. The same operation is repeated till the entire nerve cavity is firmly filled with the metal.

If the disease is wholly eradicated, and the cavity entirely and faithfully filled, a great change takes place around the tooth immediately. But we should not promise our patients too much. Fang filling is uncertain. We do not cure the disease of the tooth; we merely remove obstructions to its well-being, and nature performs the cure.

Dr. Knapp said:—The removal of the pulp of the fang is sometimes difficult, also the filling of the fang, especially of the molars. Kreosote is the best agent for cleaning out the *pus* from the cavity.

Dr. Anderson uses kreosote and arsenic to cleanse a nerve cavity and prepare it for filling. The substances are introduced on cotton by means of a broach.

Dr. Kennicott frequently extracts the nerve by the use of a piece of hickory, and sometimes stops the cavity with a well fitted hickory plug.

Dr. McKellops uses nitrate of silver, 60 grains to the oz., to clear out the fang, and employs an instrument manufacted by the New York Teeth Manufacturing Company, which is excellent for the purpose.

Dr. Perkins uses the chloride of soda to inject the fangs of teeth. Sometimes the fang has an ulcer when there is no other disease in the tooth.

Dr. Clarke treats ulcerated fangs by thrusting kreosote up the orifice on cotton, and leaving it there from time to time for some days.

Dr. Dunham did not think favorably of the hickory plug spoken of by Dr. Kennicott.

Dr. Clarke stated that in cases where the fang of a molar with a lateral decay to the nerve, required to be stopped with gold, he was in the habit of drilling a hole through the grinding surface of the enamel, in order to get access with his broach to the orifice of the root.

At this stage of the proceedings, on motion of Dr. Allport, the following gentlemen, not residents within the geographical

limits of the society, were elected as honorary members: Drs. S. Brown, of New York; Perkins, of Rome, N. Y., Smith, of Terre Haute, Ind.; Clarke, of New Orleans, La.; Knapp, of New Orleans, La.; Knapp, of Jackson Miss.

EVENING SESSION.

Subject—Gutta Percha as a base for teeth.

Dr. Dunham thinks gutta percha very useful in cases where the teeth have been recently extracted, and the alveolus very prominent, especially about the eye teeth. In these cases it is often very difficult to use metallic plates without making the lips too prominent. He prefers to use a thin plate of gutta percha rather than a gold plate, the ends of the teeth resting on the gum without a plate in front.

Dr. Smith has used gutta percha in two cases, but does not like it; especially the samples which he had, and which were said to have been made by Dr. Slayton. The texture and color were both bad.

Dr. Quinlan is of opinion that gutta percha will be found in many cases to be very useful.

Dr. Spaulding uses gold plate for temporary cases as the best material. When the gum changes much he uses gutta percha to fill up the interstice or chasm between the plate and the arch of the palate and the alveolar ridge. This plan he finds to work well.

Dr. Clarke does not use gutta percha for permanent sets of teeth, but nevertheless regards it as useful for many purposes, particularly when a piece of work constructed upon it brings the patient back in quick time for a new set on proper material. He occasionally uses it for patching up old work, which is generally neither very pleasant nor very profitable to the dentist. He thinks that when a gutta percha plate wears through very soon, it is owing to the material having been overheated, or burned by the lamp.

For lower pieces where only the front teeth are gone, he likes gutta percha, yet he has no reliance upon it for any but temporary sets.

SECOND DAY

The Secretary read the minutes of yesterday, which were amended and adopted.

Dr. Clarke was requested by Dr. Spaulding to state whether solder made with arsenic, will eat up the platina plate.

Dr. Clarke thinks it will if the arsenic is in excess. The sanguine hopes at first expressed, have not been fully realized. The experiments have not thus far been fully satisfactory, but he hopes the difficulties will be ultimately overcome.

Dr. Honsinger had one job of continuous gum, which was not successful, and only one. He proceeded to describe the case minutely. A set of gum teeth had failed in the mouth. He substituted continuous gum. This soon lost one molar, and the gum was broken and loose. Made a new set, and that gave way. Then struck a second plate and added it to the first, bringing the edge over the front enamel. This also gave way, probably on account of the many bakings.

Dr. Clarke advised Dr. H. to send his subject to Dr. Harris, of Philadelphia, who once had a similar case, which he made of cast iron, the patient wearing it to the present time.

Dr. Spaulding said, in relation to the articulation of continuous gum work it must be good, but when the antagonizing teeth are gone, the danger of unequal pressure can hardly be avoided.

Dr. Perkins had encountered the same difficulty. In such cases he has made the backing and front part of the plate exceedingly strong, and put a block of platina over the place of strongest pressure.

Dr. McKellops has done a good deal of continuous gum work. One piece after six months, exhibited the four front teeth projecting forward. He split the bakings and turned one-half the back up on the plate; then baked carefully; merely soldered the backs to the plate, not the pivots.

Had a case where the patient had worn gold plate; first made a block—then substituted gum work. The principal strength of this work is in the baking; the first bake of the body should be but just sufficient to cause the material to adhere.

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A young gentleman present was called on by the President to explain his method of making gum work. Described the process generally, but owing to the want of time, too briefly to be of much practical use.

Dr. Blake thinks that the baking should be *progressive*—each baking more than the former, fusing the whole mass.

Described a case of filling up the cheeks, which was fully successful, and is of opinion that continuous gum work is of considerable use to the profession.

Dr. Clarke says, of air chambers, that sometimes they are best, but not always. When the arch of the mouth has a hard protuberance, an air chamber is necessary; but not when the arch is spongy. He makes a large air chamber in the former case. Sometimes has difficulty with both kinds of plate.

In regard to articulation, the best teeth for use are those where the bicuspids are pitched inward. But you cannot follow the natural laws, in articulating artificial teeth. In teeth set by our best operators, the *circle* is more perfect than in the natural teeth.

Dr. Dunham is pleased with the character of the discussion this morning. Is obliged to Dr. Honsinger for his particular delineation of his *failures*. This is even more useful to us than a description of our *successes*.

Dr. Dunham sometimes uses air chambers in the cases stated by Dr. Clarke, and does not use them in soft spongy gums.

Describes a plan of making air chambers. Cuts a piece of tin an inch long and a half or three-quarter inch wide; after swaging his plate he places the tin in the female cast and strikes the plate over it. This prevents the rocking.

He takes upper impressions generally in wax; lower ones in plaster.

When the wax is introduced, he directs his patient to press his fingers against the cheek and wax over the molars, whilst he presses up the cup to its position. He presses the front wax a little inward, after taken from the mouth.

Dr. Bogue wished the opinion of gentlemen as to air chambers.

Dr. Dunham generally takes three casts, and selects the poorest to swage on at first, then if the fit is bad, on another, and so on to the last, if necessary.

Dr. Spaulding uses air chambers when the hard prominence exists in the arch. In almost all cases of partial sets he uses air chambers.

Makes the edge of the chamber square and not rounded, to prevent the expansion of muscle into the chamber.

In order to produce the square edge he cuts out a piece of the thin plate. Though shallow, the chamber will not fill with flesh; and its impression is scarcely perceptible to the eye Considers them better than deep chambers.

On the subject of impressions he has settled upon wax exclusively unmixed.

Uses sheet zinc to strike off a preparatory plate or cup. In this plate he places sheet wax of equal thickness and warmth. When the gum is spongy he cools the wax a little.

In lower plates when the sheet of wax is placed on the zinc plate, he gently presses the wax on the zinc die, to give an *approximation* to the true forms. Takes cold water into the mouth to cool the wax.

In lower plates it was his custom to limit the plate at the movable muscles. Draws a line on his plaster with a pencil where he judges the muscle will move. Increases the suction by remodeling the edge of the plate in front.

One of the most difficult points to fit is behind and around the condyle of the jaw. Attaches the rim to the edge of this curved edge of the plate. This curved edge not only increases the suction, but may be made to fill up the mouth and keep out the lip as desired. Around the condyle it is sometimes necessary to cut out a wedge of the plate. Sometimes injects cold water about the condyle to harden the wax before removing it.

The zinc plate may be quarter of an inch wider than the gold plate. Does not spread the zinc plate at all at the sides.

Dr. Dunham asks whether Dr. Spaulding ever springs the zinc plate by unequal pressure. The body of wax must be as thin as possible, and not break, also the wax must be very soft.

A hole must be in the centre of the plate to let in the air before removing.

Sometimes he pares off a little of the plaster cast in front, to compensate for the imperfect fit over the edge of the alveolus.

Dr. Smith, of Ottawa, wished to know whether an *atmospheric pressure plate* is the same as a *suction plate.*

Dr. Dunham differed from Dr. Spaulding on the subject of atmospheric pressure; he believes that atmospheric pressure does exist, because if a small orifice be made into an air chamber the plate will drop.

Dr. McKellops must say of central cavities that they are useful. Thinks that in flabby mouths plaster is better than wax.

Dr. Spaulding responds that wax impressions caused no more necessary pressure than plaster, if the wax is sufficiently warm.

Engrave a groove in the exact place on the plaster cast where the plate is to terminate on the palate. This forms a flange on the plate for its more perfect adaptation.

Dr. Anderson has thought the air chamber was sometimes used for ornament. Thinks the prettiest form of a plate is that of nature. Thinks the pressure should be removed from the palatial arch for the purpose of avoiding the rocking of the plate. For this purpose he removes an equal surface of the plaster cast, excepting near the posterior part. This plate will ultimately settle about enough to fill up the cavity. Thus the pressure is brought upon the alveolus where it belongs.

Dr. Clarke says, we have two principles, viz. *cohesion* and *atmospheric pressure.*

Capillary attraction is a very different matter; it pertains to fluids and small tubes, like those in the sponge.

Dr. Fitch denies that cohesion or attraction has anything to do with the plates of teeth. They adhere from atmospheric pressure. Has found air chambers in some cases important.

Dr. Spaulding thinks the perfect fit of the margins of the plate more important than the fit in its middle parts.

Dr. Perkins denies cohesive attraction and asserts atmospheric pressure, in the case of plates.

Professor Palmer, of the Michigan Medical University, was requested to explain the terms cohesion and adhesion, which he did.

Two kinds of mechanical attraction—all matter in creation has the attraction of gravity, operating at all distances. Also an attraction when brought into absolute contact, called cohesion. He says there is no essential difference between cohesion and adhesion.

Thinks the *adhesion* by the atmosphere is not identical with the *cohesion* of the books.

Adjourned till half-past 2 P. M.

SECOND DAY—AFTERNOON SESSION.

Dr. McKellops moved that the constitution of this Society be published.

Resolved, That the Secretary be requested to furnish Dr. S. Brown with a copy of the constitution for publication in the Forcep.

The subject of gold as fillings for the teeth, was the order of business.

Dr. Clarke has found that crystal gold has already far surpassed his expectations. He has seen several teeth filled by Dr. Allport, of Chicago, that surpass anything he had ever before seen.

An example of two central incisors from which the ends of the teeth had been removed one-fourth of its length. These plugs have now stood about 19 months, and are as perfect as at first. He has never seen anything so fine.

This class of operations has of late done more to elevate the profession than anything else. The class of men who are doing this kind of work encourage us all to make high endeavors in our art.

In thus complimenting Dr. Allport, he does not mean to say that he is going home to throw away his tools, and turn blacksmith. No such thing, but he is going back to endeavor to imitate these great examples.

Dr. Smith once thought he could plug a tooth tolerably well. But he had lately seen a first bicuspid, filled by Dr. Allport, two-thirds of which above the gum was of crystal gold. It preserved the original form of the tooth and performed all the purposes of mastication.

Dr. Knapp (of N. O.) thinks that cylinders are the best form of gold for plugs as a general thing. This system of cylinders used by Dr. Clarke, he thinks is new. That any former methods claimed to be such were quite different from this. Crystal gold will doubtless succeed in some cases, especially in building up parts of teeth, such as he had seen of Dr. Allport's, better than any kind of foil.

Dr. Knapp, of Miss., was here named and elected an honorary member of the Society.

He returned thanks for the honors, and stated that he has succeeded better with cylinder fillings than with gold in any other form.

Dr. Spaulding stated that he had regarded crystal gold as the very best material for filling very shallow cavities; and also in building up structure, the crystal gold is the perfection of material.

Cylinders will make the best filling in the shortest period of time, and with sure labor.

The first specimen of cylinder stoppings I had seen were by Dr. O. P. Laird, of Columbus, Ga., when he was in Savannah. He saw also ten years ago plugs by Dr. Badger, which were very excellent, better than himself can do. He had understood that Dr. Badger used cylinder plugs. He formerly suggested to Dr. Clarke the propriety of seeing Dr. Badger—but Dr. Clarke has made improvements in the method of forming cylinders. He does not wish to deprive any gentleman of his laurels.

On the whole he regards cylinder plugs as equal to any other, not excepting crystal gold. The plugs of ordinary form, of crystal and cylinders respectively, are so nearly equal that the difference is not worth regarding.

Dr. Clarke has always aimed to accord to another dentist all his rights and improvements. In the winter of '49, in New Orleans, he formed the acquaintance of Dr. *Badger*, and was perfectly satisfied that Dr. B. could excel him in filling teeth.

He gave me a hint of his method, by rolling a piece of leaf into a cylindrical form. I then entered upon my plan of rolling cylinders on small tweezers, such as I had seen in the hands of Dr. Badger, which he used for another purpose.

I have stated often that I received my first idea of cylindrical fillings from Dr. Badger, I have claimed nothing for myself. Whatever I have belongs to the profession.

Dr. Allport thinks the profession are pretty well aware who is entitled to the credit of inventing this method of filling teeth, and whoever he is, he enjoys the satisfaction of knowing it.

Dr. Knapp (younger) says there is nothing before this body to show that Dr. Laird ten years ago filled teeth with cylinders.

Dr. Kennicott says that as long ago as 1820 he saw Dr. Cox in New Orleans fill teeth with cylinders.

He has failed with crystal gold, many times. Not a particle of moisture must touch a gold filling of any kind.

Dr. Honsinger thinks that crystal gold has mostly failed in consequence of having been introduced in too large quantities. He uses very small instruments. Has built up teeth when one-third gone.

Dr. Bogue gives his testimony decidedly in favor of crystal gold.

Dr. Clarke has used but little crystal gold, but wishes to know whether the serrated instruments do not fracture the surface of the cavity, in consequence of their sharpness.

Dr. Perkins—I have some experience in this department of filling with cylinders.

If any persons will come to Rome, I will show them fillings built up with foil by Dr. Allport eight years ago, in fine condition now.

I have used Watt's gold from the commencement of his manufacture, and regard it a very useful adjunct to foil. Has recently used about one-third crystal gold.

Does not think a person ought to say that foil cannot be made to perform anything that crystal gold can do. Nor can he assert positively that it can.

He described at length the manner of stopping with crystal gold.

Dr. Clarke requested that Dr. Allport would describe his method of stopping with crystal gold.

Dr. Allport could hardly express his gratitude for the kind and flattering compliments which had been bestowed upon him.

Does not use crystal gold exclusively. Foil constitutes about two-thirds of his fillings. Sometimes he uses pellets, and cylinders and crystals all in the same cavity. The use of crystal gold requires four times the time for insertion that is required by foil.

Never saves any more of the enamel than is strong and healthy—but saves all the front possible. He presses the crystals in the direction of the length of the tooth as much as possible. Uses serrated instruments, small and sharp.

If a plug gets wet when of foil or pellets, or crystals, it can be cleaned by cloroform and wiped dry with bibulous paper.

The credit due to crystal gold is attributable to Dr. Watts. Since July last his gold has been good, very good—all that is required.

He can build upon a surface after it has been polished, or upon solid metal.

Dr. Spaulding explained the reason why serrated instruments packed the crystals in such a manner as to cause them to cohere in a mass, but it must be borne in mind that the serrated points do not push all parts of the crystals with equal solidity, at the polished surface they become nearly so.

Dr. Dunham does not think he could stop front teeth better with crystals than with foil; he never allows the force to fall wholly upon one tooth, but introduces a wedge between the teeth, to connect the force with two or more teeth.

The Society next proceeded to the consideration of

CONTINUOUS GUM WORK.

Dr. Spaulding thinks the gum and body may be made strong enough.

Dr. Kennicott gives his word for continuous gum work and esteems it the perfection of artificial teeth.

Dr. Clarke is using it pretty extensively, and thinks it occu pies an important place in the profession. Deems it as useful as any kind of work that has ever been made. It is artistic in an eminent degree, and is not liable to the objections raised against gutta percha, that it lowers the standard of professional skill.

Dr. Spaulding assents to all that Dr. Clarke has said in favor of continuous gum, yet there is one serious objection, which is the liability of breaking the teeth either in the process of manufacture, or by a fall afterwards, in which case it is a sort of work very difficult to repair.

Dr. Dunham regards the breaking of the gum as a much greater objection than the breaking of the teeth. This he has not been able to avoid.

Dr. Kennicott has seen gum work that nothing else has ever equalled. It can be adapted in color both of gum and teeth to suit the complexion. The frequent heating of this work is very liable to injure the teeth.

Dr. Perkins regarded it as unfit in all cases.

Dr. Smith desired to know whether tobacco did not make gutta percha sets very disagreeable. Dr. Clarke replied that a smoker would find his teeth disagreeable.

Dr. Dunham has charged $75 for sets of gutta percha teeth, which is the regular price in St. Louis. Thinks twenty-five of his patients are wearing them comfortably.

Dr. Allport has used it in cases where it answered a very good purpose for temporary work.

Dr. McKellops moved that when the Society adjourn it be to meet in the city of St. Louis, on the 3d Wednesday in May next. Adjourned.

In the evening of the 31st an entertainment was given by the dentists of Chicago at the Briggs Hotel. In addition to the many entertaining and instructive speeches by the members of the dental profession, Dr. Palmer, one of the professors of the Michigan Medical University, who knows exactly what to say, with decided ability to say what he thinks and wishes in the most fluent and condensed phraseology, made two eloquent addresses, with which the members of the Society and invited guests were greatly delighted.

The Chicago meeting of the Dental Society of the West will long be remembred with pleasure and profit by those present.

SOLYMAN BROWN.

[*Forceps.*

ARTICLE IV.

An Essay on the Sensibility of Dentine and its Treatment, read before the Pennsylvania Association of Dental Surgeons, December 12, 1855. By J. D. White.

Mr. President and Gentlemen:—It has been a long time since I have had the honor of appearing before you in the capacity of an essayist, and with an eye ever directed to the investigation and discussion of practical subjects as best suited to our society gatherings, I have selected for the subject of a short essay, the Sensibility and Treatment of Dentine. The tubular structure of this substance renders it extremely difficult to manage its treatment for sensibility with such exactness as at all times to enable us to hold the treatment within such bounds as to obtain the most satisfactory results. Again, the conditions of the case, as to whether it is deep-seated or superficial decay, or in a younger or older tooth, or of a peculiar impressibility of the organ to the different substances employed for the purpose of treatment, it is necessary that great caution should be exercised, and a long experience enjoyed in practice, to insure invariable and successful results. It is doubtless out of these causes that so great a diversity of opinion grows as to the best course of treatment to pursue, or if any remedial means be employed or not. The different views advanced when this subject was under discussion before the late American Convention of Dentists, held in this city, fully establishes this fact. That there is an exquisite sensibility of dentine, daily experience shows; yet it is not universal, as some teeth can be cut with an instrument without exciting apparent suffering. And yet those teeth seem to possess a vital and healthy condition, and an internal pulp similar to those of a sensitive character. And again, there are different degrees of sensibility, varying from the bearable to the unbearable. This state of things does not admit of

ready explanation, as it would seem to be rational that similar organs or tissues in health, would be endowed with analogous functions, and be impressed by similar stimulants. We do not seem to be capable, by practical tests, to push this peculiar condition of dentine to a different cause, although it seems fair to presume that it is invariably due to the irritation of nervous fibre. The same patient does not at all times suffer the same degree of pain of the teeth, by the friction of the instruments of the dentist, or by taking acid substances into the mouth; nor do all the teeth in the same mouth, or in the same state of decay, possess the same sensibility. This diversity of condition, and uncertainty of treatment, perplexes the impatient operator and causes him to abandon any attempt at treatment by medicaments, and imposes the whole burden of success consequent upon the treatment of those sensitive organs, to the endurance of the suffering patient. An ingenious theory, advanced by Dr. Goddard of our city is, that the sensibility of dentine is due to *concussion*, the fluids contained in the tubuli of the dentine being given off by, and resting upon the investing and sensitive membrane of the pulp, become disturbed by friction passing over their outer extremities, is transmitted to the surface of the pulp and induces pain. This theory would seem, by many cases, to gain some force, from the fact, that if we attempt to excavate a tooth when the cavity is very wet, it is more painful than when it is dry. The friction of the excavator tends to dry the cavity, and if we cease cutting when the operation is but half accomplished and the fluids of the mouth are permitted to pass in, it will be found to have taken an increased sensibility. Hence, a number of cases may be successfully treated by observing the precaution of keeping the cavity dry. This may possibly be explained, however, by the probability that the nerves in the tissue are in a more impressible or normal condition, while wet, than when dry. And again, the nerves when cut off when dry may contract and constantly keep retreating below the surface and keep out of the way of the instrument until the cavity is prepared. It is difficult to understand how every case that is met with can be explained, however, by either of the

above named processes, or without admitting the actual presence of nervous tissue, but by being of such extreme delicacy as to be exceedingly transient and to be modified by such varying and undefinable conditions as to evade the scrutiny of the observer as to what the modified conditions are actually due. At one time of life this tenderness of the teeth may be extreme, and may disappear for a term of many years, and reappear as before. A case of this kind came under our notice about fourteen years ago. A gentleman of about forty years of age applied to us for advice, suffering from extreme sensibility of the necks of all his teeth; the cavities of decay were unusually tender, and contained a humid character of decay. The health of the patient was delicate from intense application to business. His former dentist had abandoned his teeth and informed him that he would inevitably lose them all. We treated a number of his teeth for this tenderness. The patient visited a southern climate for several winters for his health, which improved, and the tenderness left his teeth entirely, and they ceased decaying for a number of years, except forming a few cavities on the approximal surfaces, but which could always be operated on without pain. This condition lasted for about ten years, when the tenderness of the teeth returned, and with it a rapid process of decay. The old surfaces are softening, and the slightest exposure of new surfaces develops the extreme sensibility of their former condition. This case would favor the inference that the sensibility depended for its sensible development more upon the condition of the impressibility of the nervous system of the patient, than upon the presence or absence of nerves.

Escharotics, which act upon the animal tissues of other parts of the body, are more successful in treating this condition of dentine than sedatives. Opium or morphia may be applied for a long time without producing any sensible result, therefore *arsenious acid*, *caustic potash*, *lunar caustic*, *nitric acid* and *chloride of zinc*, as well as the *actual cautery* have in turn been freely employed. Among those substances arsenious acid is the most potent, reliable and painless where it can be employed with safety, such as in superficial cavities. But it is imprudent

to apply it to a cavity that nearly reaches the pulp, or where it cannot be seen by the operator in from twelve to eighteen hours, as it will permeate any thickness of dentine if left on the part for a longer time, and produce inflammation of the nervous pulp. We prefer to apply it dry on cotton, or, if the cavity is very shallow and on the labial surfaces of the teeth, then we apply a portion of it in powder to the part, and spread over it a thin coating of white wax; or, where that cannot be done, we place over the part a lock of dry cotton-wool and throw a ligature around the tooth and secure it in that manner at least until the cavity can be excavated sufficiently to secure it with wax or cotton. It is not safe to apply the arsenic until the sensibility is totally gone, as it will be found after a time that the parts have absorbed too much, and the pulp will become inflamed a few days after the operation is considered to have been perfect. It frequently happens that when the protection to the arsenic has been removed, that the sensibility has not been much altered. In such a case let the cavity be exposed a while to the air and fluids of the mouth, and it will be found to have changed sufficiently to allow of easy excavation. Some times, when operating on the front teeth, we wait a few days, leaving the cavity open, in order to make sure that too much shall not be applied. It often happens, too, that after a partial suspension of sensibility has been effected by the arsenic that the chloride of zinc will finish the matter without exciting so much pain as if it had been employed at first. It is an error to apply arsenic combined with creosote, because the creosote is absorbed readily by the dentine, and without destroying the sensibility of the surface, especially if a small quantity be applied frequently, sufficient may be absorbed to inflame the pulp or irritate it and place the whole tooth in such a highly sensitive condition to heat and cold and to the touch, as to render it impossible for the tooth to be operated upon. If, under such circumstances, the tooth should redden in color, it should be drilled open and left without applying any thing until it had entirely recovered its normal sensibility; a neglect of this precaution even in treating the exposed pulp, when one application does

not destroy its vitality, renders the use of the arsenic an objectionable substance in our operations. When excavating a cavity after applying arsenic, we do not feel safe until we cut down sufficiently to impinge upon a sensitive surface, for fear that we have left enough arsenic in the dentine below our plug to inflame the pulp when it approaches that substance. It might be said why employ a substance so dangerous in its tendency, and by which a tooth, by the slightest circumstance or uncertainty in using it, may be lost, or, at least, endanger the loss of its pulp? We would answer, that we believe that more teeth are lost, and more pulps exposed by defective plugging, consequent upon a too sensitive condition of the organ to be properly plugged, than by injudiciousness in the use of arsenic. We have been told this day by two patients that they never could keep plugs in their teeth until the nerves became exposed, on account of the fact that they could not bear the operation of properly cleansing a plugging, and we are now treating four front cavities that have been plugged frequently by a distinguished dentist, in which the plugs would not stay because the cavities could not be shaped to hold them, on account of too great a sensibility of the parts. Teeth are frequently found to be too sensitive between, to be filed or chewed upon, or be picked out or kept free from foreign substances; we treat these cases with arsenic to great advantage. Chloride of zinc, with us, takes the place of either of the other substances named. Where this will not act, neither of the other substances will. It will not blacken the teeth as the nitrate of silver, nor is it as irritable to the gums and mouth generally as the nitric acid or the caustic potash. In some teeth this substance acts like a charm and only by exciting a slight pungent or warm kind of pain. We give the history of some cases of this kind, where it proved invaluable, in the News Letter of October, 1854. Yet in some teeth it excites the most intense pain, without obtunding the tenderness of the parts in the slightest degree. We never employ the chloride of zinc for destroying the exposed nervous pulp, as has been inadvertently reported of us in the American Journal of Dental Science, July, 1855. But that we have used it for many

years with advantage in the treatment of sensitive dentine is certain, and of which we have spoken elsewhere, and therefore think it needless to consider the subject any further at this time.—*News Letter.*

ARTICLE V.

An Improved Method of Using Gold Foil. By PROF. ARTHUR.

IT is now somewhat more than a year since I called the attention of the profession to what I deemed a new method of using gold foil for filling teeth. The method proposed was to roll up the foil, very loosely, in the form of a rope, pass it quickly through the flame of a spirit lamp, cut it up into small pieces, and pack it into the cavity to be filled, with sharply serrated instruments, condensing each piece as it is put into place. The object of heating the foil, as I stated, is to give it a quality of adhesiveness not possessed at the time of using, before it is heated, and so affecting its condition, that each piece put into the cavity is made to adhere, closely, to the portions preceding it, although these may have been thoroughly condensed. It was not, as I stated in the article referred to, simply the annealing the gold, at the time of using, that I supposed to be new, as this I knew had been done many years before, but in addition to this, of condensing it thoroughly in small portions, with sharply serrated instruments. I found great advantages from its use in this way, and simply wished to place other operators on the same track I was pursuing myself.

It was immediately declared by a number of members of the profession, that there was nothing new in the method proposed, that it had been adopted and followed by them years before the appearance of my article. Now, I do not mean to question the sincerity of these gentlemen, some of whom occupy high places as operators of skill and integrity, but I am, nevertheless, con-

vinced that I could not have been fully understood by them, for I am well satisfied, from the known character for liberality of some of the gentlemen referred to, that if they had used gold foil in this way with the same advantageous results that I have found, they would, long ago, have communicated it to the profession. I could not, of course, suspect them of having availed themselves of its great advantages, and of designedly, during a period when there was the freest interchange of ideas between liberal members of the profession, withholding this valuable mode of operating from their fellow practitioners. I can only come to the conclusion, then, that I have not been clearly understood, and in several instances, a personal interview with some of these gentlemen, has proved this to be the case.

There is, indeed, another view to be taken of the matter, it is this: The modes of practice, and the capabilities of different operators, differ so very widely that one may find that he can accomplish with gold foil, as it comes from the manufacturer, what another would not attempt, so dim would be his prospect of success. I am free to confess, that I have in years past seen many operations with gold foil, used in the ordinary way, superior to any of the results I have been able to reach with all the labor and time I have been willing to bestow—and I have never been sparing in these essentials of good dental operations. Why it was so, or what was the difference in their methods of manipulation and mine, I have never, in conversation, or in any other way, been able to discover. It is more than probable that this superiority consists in those undefinable qualities which nature gives to some men, enabling them with ease to bring into actual existence the ideals in their own minds; that remarkably prompt and harmonious sympathy between the mind and the hands which is never acquired, if it is not born with the individual. I am quite willing to acknowledge, that with this facility I am endowed in but a limited degree, and that all the good results I have reached, if any, in my profession, has been by hard, patient labor, in the face of this serious natural disability. It may be, then, and it probably has been, lack of skill as an operator which has rendered me dissatisfied with the ap-

pliances of our profession, as I found them, and to have led me into the habit of looking anxiously about for the means of getting rid of the difficulties by which I found myself surrounded. For my own use, as I have repeatedly stated, I found the best gold foil defective. I desired something which would better supply my wants. In looking around me I found a great many honest and faithful fellow practitioners in the same category with myself. My earnest desire and effort then was, to find some material which would give better results with less skill, even if it should demand more time and labor. It was with this feeling that I eagerly took hold of sponge gold, as it gave promise of enabling us to get over some of the most perplexing difficulties attending the use of gold. With the same feelings I have turned to the use of gold in the manner I have proposed as a still further advance in the same direction. I have no hesitation in saying that I can obtain better results in the use of either of these materials, in filling teeth, than I can with gold foil as commonly used, possibly at the expense of more time. But I am not at all surprised that gentlemen who can accomplish by the aid of superior skill, with the common material, what I do with greater labor and less skill, should feel no desire to adopt a new method which affords them no advantages. I cannot hope, then, to be of use to these gentlemen, but I feel well satisfied that I may be to that somewhat numerous class of dentists, who, like myself, need all the possible aids to good practice with which they can be furnished. And, whether the system I propose is really new or old, it has certainly never, hitherto, been formally brought to the notice of the profession.

Since the article referred to was published, I have used gold foil in the manner proposed, exclusively, and so have a number of others, with the most beautiful results, and with daily increasing satisfaction.

I have found that it is not necessary to raise the temperature of the foil to a red heat, so that the term, annealed gold, is rather a misnomer. It is no more annealed gold after it is exposed to the slight degree of heat necessary, than it was before; but, for want of a better name, it may probably be well to distinguish it by the name which has appeared to attach itself to it.

It must be premised that all gold foil will not answer for use in the manner proposed. The slight heating to which it is necessary to subject it, does not produce any change in the character of the gold itself. It can only restore it to its original condition. If it is not adhesive after it is annealed by the manufacturers, it will not become so by any degree of heat to which it may afterwards be subjected.

Now, it has been the object of the best manufacturers of gold foil to get rid of the tendency of gold to assume this adhesive character in the course of manufacture. This is accomplished by some means not generally known. It occurs to me, however, that efforts of this kind have, to some extent, been wasted, as by exposure to the air, gold foil, which is very adhesive at the time it leaves the manufacturer, will lose this quality entirely.

How this occurs is a question of interest. It is, of course, well known that gold and other metals become so changed when hammered, as to lose, in a very great measure, their malleability and ductility. But, when exposed to a red heat, such a change is produced in the relations of the particles composing the metal, that its lost properties of malleability and ductility are entirely restored; this application of heat is called annealing.

Experience has shown that although some change in the relations of the particles of which metals are composed, is produced by hammering, or a process analogous thereto, and this change renders the most ductile metal exceedingly brittle, it does not seem that any such change takes place from simple exposure to the atmosphere.

It is found that a slight degree of heat is sufficient to restore the adhesive properties of the surface of gold foil which originally possessed this quality.

If a piece of gold foil, originally adhesive, which has been exposed to the atmosphere for a few days, be rolled up, loosely, into a rope and cut into small pieces, it will be found that these pieces may be shaken together without adhering to each other. But, if they are laid upon a sheet of thin metal and held for a few minutes over the flame of a lamp, or heated slightly in any other way, the pieces, by their own weight, will adhere to each other so closely as to be separated with difficulty.

Now, it is clear in this case, that the foil by simple exposure to contact with the air, does not undergo any change analogous to that produced in the metal by hammering. It does not require annealing to restore it to its original condition, but the application of a slight degree of heat, not enough, as already intimated, to produce a change in the relations of the particles of which it is composed. But this statement has been questioned; it is supposed, as I have heard it urged, that the thin plate of metal composing the foil, is likely to undergo a change similar to that produced in a larger piece by hammering, simply by handling, and the pressure to which it becomes accidentally subject. But if these very same pellets, which have become so adhesive under the influence of slight heat, are separated and allowed to remain until the next day, all their adhesive properties will be gone, and no ordinary pressure will make them unite. If they are again heated, as directed above, they again become as adhesive as before.

A change, then, appears to have taken place upon the surface of the metal. What is this change?

Some years ago, while making a series of experiments in electro-metallurgy, I found that the galvanic deposit could not be made to adhere to a metallic plate, which had been exposed to the air for twenty-fours; but this plate, if warmed, was at once so changed in condition, as readily to receive the metallic deposit, which adhered to it. Indeed this was one of the means proposed to prevent the adhesion of a metallic deposit, when it was desired to take a metallic copy of a certain thing.

In Smee's "Electro-Metallurgy," (pp. 109 and 18, English ed., 1851,) this fact is attempted to be accounted for by supposing that a film of atmospheric air is deposited on the surface of the plate, and that this is dissipated by the application of heat. Whether this theory is correct or not, it seems evident that it is the surface only that is affected.

It is evident, then, that gold to be used advantageously in this way, must, when first made, be adhesive. And this, unquestionably, is the reason of the great differences to be observed in gold of different manufacturers, when attempted to be used in

this way. I have tried some foil, unquestionably pure and good, which could not be worked in this way at all, and other specimens which could be used with very trifling advantage.

The foil I first used in this way, is that sold by Jones, White & McCurdy. It worked better than any I had then met with and I still find it, in use, as good as any other. Some specimens of Morgan's gold were then put into my hands, prepared to be used in this way; it worked equally well with that mentioned above. Abbey & Son prepared, at my suggestion, some foil to be used in this way, and it possesses the same fine quality. Their customers, who feel disposed to try the use of foil in the way I am describing, will find it necessary to state that fact when they order, as his gold, sold for ordinary use, does not possess the necessary adhesiveness.

I have not tried, to any extent, the gold of any other manufacturer, although I am assured by all that there is no difficulty in making gold as adhesive as can be desired.

In order to use gold successfully in this way, everything depends upon the instruments employed and the manner of manipulation. The instruments are simple and easily made, and the manipulations are not difficult. All that is necessary is strict attention to certain essential points.

In the first place the gold must possess the quality I have described, and I would advise any operator who is disposed to make trial of gold in this way, to procure gold of one of the manufacturers named above, stating the purpose for which it is wanted.

There are two methods in which gold may be prepared for use in the manner proposed. It may either be used in the form of pieces cut from a rope, or the sheet may be cut up or torn into small pieces, without folding or rolling it up.

1. In preparing the pellets, the sheet of No. 6 foil should be cut into strips according to the size of the cavity. No definite directions can be given upon this point, as experience alone can teach an operator how much he may want for a particular cavity. I generally cut my sheet into three strips. These strips should be rolled up loosely, *as loosely as possible*, laid upon a thin piece

of platinum or other thin metallic plate, and heated over the spirit lamp. The degree of heat is unimportant, if continued long enough, but it will be sufficient if the platinum is allowed, directly under the rope of gold, to reach a dull red heat. The roll is then cut up into pieces of a suitable size. The direction to roll the strip up loosely is important, as many persons who have attempted to use gold in this way, have failed because they have rolled it too tightly.

The instruments used for this gold should terminate in two or more sharp points. The most convenient for general use are those made with two, three and four points.

The curve given to the shank of the instruments must, of course, be determined by the operator, to suit the special case.

The points must be sharp; they cannot be made so without a suitable file, and the best file for the purpose is that known to watchmakers as a pivot file. It has a sharp, knife edge, and is admirably adapted to the purpose.

The temper given to these instruments must be somewhat harder than that of ordinary plugging instruments, a little harder than a spring temper. It is difficult to state in writing the exact temper to be given; this can best be ascertained by a few trials. The instruments should be as hard as they can be made without rendering them so brittle as to break with necessary use.

In using gold in this form, the greatest difficulty to be encountered is to fix the pieces first put into the cavity; after a part of the filling becomes firmly fixed in any part of the cavity the rest of the operation is very easy. I have, for a long time, been accustomed to hold a small instrument in my left hand, and with it keep in place my first pieces of gold until they become fixed. Sometimes, however, this is extremely difficult, and, at times, impossible. Dr. Louis Jack, suggested a very useful way of getting over the difficulty referred to. He proposed to drill two small holes about a twelfth of an inch deep in a part of the cavity where there is no danger of reaching the pulp, begin his operation at this point, as there is no difficulty in getting the gold

to remain in such small cavities, and build the filling up from these two points.

After the first pieces are fixed, pellet after pellet is taken up with the point of the instrument used, carried to the desired place, fixed by pressure against the gold previously put into the cavity, and condensed, first with large and then with small instruments, taking care to carry it against the sides of the cavity. Thus going on, adding piece after piece, until the cavity is filled.

It is essential in using gold in the manner proposed, that the cavity should be kept dry; if the slightest quantity of moisture finds its way upon the surface of the filling, the operation for the time is at an end. I have seen cases where an apparently good filling has been made under the saliva; but I cannot regard such a filling as so secure and reliable as when no moisture interposes itself between the layers. If in performing a long operation it is found that the saliva is encroaching upon your filling, burnish the surface, which, if you have manipulated properly, ought to be condensed. Allow your patient to void his mouth of saliva, and then recommence your operation. Dry the filling and the parts near it, then scrape the surface so as to remove any moisture which may have become confined about the surface. More gold may then be added, as well as if no moisture had reached the filling; and so, more and more may be added, until a satisfactory filling is made.

2. I prefer, however, to use gold, not in the form of pellets, but the single sheet, neither folded nor rolled, but cut or torn into pieces of suitable size, after the sheet has been heated on a piece of platinum or any other kind of thin metal plate.

The instruments in this case differ from those just described. They should have a somewhat broader surface, cut with as many points as can be got upon it. The serrations should not be so deep as in the instruments for pellets. I have some instruments with eight, ten, twenty and forty points.

After the gold is heated I generally hold it in a pair of spring forceps, as it should not be touched with the fingers, and tear it in pieces of a suitable size with a sharp instrument. As I am

not now writing for novices in the profession it is unnecessary to go into detail; every operator will soon learn, by experience, what size his pieces will need to be for any cavity in hand.

After drying the mouth, the cavity, and the parts about the tooth to be filled, with great care, a piece of the gold is carried into the cavity. If I can hold it in place until I can fix a sufficient quantity to make a beginning for my filling, I prefer to do so. If I cannot conveniently do this, I adopt the method, where I can, of Dr. Jack, mentioned above. After the gold becomes fixed in any part of the cavity, the rest of the operation is easy. The thin pieces of gold are taken up and condensed thoroughly in thin layers with the broad, sharply serrated instruments, the operator being careful not to gather any considerable quantity under his instrument while he is condensing his gold. Care must be taken, too, to carry the gold against the sides of the cavity as the filling progresses. The rapidity with which a large and accessible cavity may be filled, when the gold is used in the manner described is surprising. But when the cavity is filled, using ordinary pressure with the instruments described, the gold will be found so dense as to be unyielding under small and sharp instruments. The reason of this is easily seen; the condensation of the gold in thin layers has been effected, and it is easy to understand how a few thin layers of gold over a broad surface, may be brought as compactly together with comparatively slight force, as a large number of layers such as are to be found in a pellet, with much greater force and with much smaller instruments.

I have been in the habit of using No. 6 in my operations. In thin, frail cavities, No. 4. No. 8 has been proposed by Prof. Townsend, and no doubt will facilitate the operation in large cavities by using it in a single strip.

I am well aware of the difficulty of describing, in a manner to be clearly understood, any method of manipulating. A few demonstrations will do more to elucidate a practical subject than pages of explanation. I should suppose, however, that the suggestions I have made, vague as they may be, will enable any experienced operator to ascertain for himself the amount of value of the method of operating which I have been describing.

In this vicinity a number of operators have adopted this method with so much satisfaction and success, that they declare they could not fill the cavity of a tooth, at all satisfactorily to themselves, in the manner they had been operating for years before. I have seen first class operations from the hands of men who had had no experience in our profession—such operations as certainly could not have been performed, in the usual way, except after years of practice.

I feel impelled to urge, strongly, every one in the profession to give this method a fair and thorough trial, and I am satisfied that when once understood, it will be generally adopted, to the almost entire exclusion of other methods of using gold foil. I have never yet known an operator, after he has once become fully aware of its advantages, who has abandoned its use.—*Ib.*

ARTICLE VI.

On Lining Teeth.

Prof. J. D. White:—*Dear Sir*—I have been favored for some time with you valuable "News Letter," and often find myself much benefited by some of its contents. I have often thought of expressing my sentiments on subjects relative to our profession through your paper; but, feeling a delicacy as to my competency to do any good, I have deferred until now. Possibly what I now propose to offer as an improvement may be an old thing with many of the dentists of the east, but I am satisfied that it is not in general use.

I will here give you, briefly, my mode of backing teeth. I prepare the work in the usual way, and when ready to fit on the backings, I take platina plate, rolled as thin as letter paper, cut out of this enough to cover the face of the tooth, and fit on as with gold; then withdraw the teeth, (after preparing them

all in the same way,) draw the points of the rivets together, and file them almost on a level with the lining. I then set them up in plaster and sand separately; after properly dried, I take small scraps of gold plate, enough, guessing at the quantity, to make a heavy backing, and melt them thoroughly on the platina linings; this makes it adhere firmly to the tooth; then, next in order, is to dress it up with a file, leaving a heavy pure gold backing, ready to set back in the plaster and solder to the plate; it requires but little solder to unite the teeth to the plate, and when accurately done requires but little filing to fit it for the lathe. I experimented on several teeth in this way, breaking them after putting up backings, and found the gold to flow under the platina lining and imbed itself into the tooth, making it much more durable and in every respect more neat than the plan usually pursued. I have been putting up work in this way for some months, and from actual experience, can cheerfully recommend it to the profession. If you think this worthy of notice, you will give it a place in the Dental News Letter, and oblige

Yours, respectfully, J. F. Wilson.

Ib.

ARTICLE VII.

Brief Extracts from the Proceedings of the Pennsylvania Association of Dental Surgeons.

Meeting of Feb. 3d.—Dr. Daniel Neal addressed the Association at considerable length on the subject of "Examination of the Mouth and Extirpation of Decay." The well known practical character of the Dr. will give an idea of the nature of his remarks.

In the course of the remarks, allusion was made to a great want of thoroughness constantly manifesting itself in the performance of dental operations, Dr. Neal affirming that in most

cases where an operation on the teeth was pronounced completed, proper instruments would discover quite as many cavities as had already been treated. Exhibited to the members instruments employed by himself in examinations, which certainly seem capable of discovering the most minute cavity. Also suggested, in reference to the extirpation of sensitive dentine, that among the best obtunders should rank sharp instruments. Alluded to his manner of removing the dead bone, the care oftentimes found necessary to prevent inflammation of the pulp, presenting, indeed, an aggregate of important suggestions, which must have demonstrated to every member the advantages of dental association.

Special Meeting, Feb. 19.—The question for debate was "Alveolar Abscess."

Dr. Harris remarked—the subject was an interesting one; considered it imperfectly understood. Alluded to views entertained by different authors. Mr. Flourens maintaining that the internal periosteum is but a dipping through the foramen of the external, others hold such a view as a great error. If the first was true, then we had the same membrane performing a two-fold duty—secreting at one point, absorbing at another. If the reverse was true, then we might puzzle ourselves to explain the close existing sympathy.

The peculiar formation of the pus bag, the effects of so abnormal an agent on the surrounding living tissue—particularly its effect upon the particular organ involved—these, and the many collaterals could not be thought to be investigated without great accruing benefits, both to ourselves and to those whose sufferings we are called on to relieve.

Understanding the pathology of the disease, efforts and labor should be made in a hygienic direction; for, when it is considered the dependence of a tooth for health is on the vascular supply yielded through this membrane; and when, further, it is considered that it is not an improbable thing that it is the only source of tooth life, (and as, indeed, daily experience seems to prove,) it may be concluded that periostitis has so far progressed as to sever the attachment, the tooth is beyond any remedy of

our pharmacopœia. For his own part, believed this to be the case, and would like to see the discussion take the direction of causes and prevention.

Prof. Buckingham.—As the result of, first, simple vascular excitement, and, second, inflammation running into gangrene, remarked that we had the disease known as periostitis once thoroughly fixed. Inclined with Dr. Harris to the belief that the teeth affected is beyond redemption. Suggested that it might remain in the mouth, and in individuals of certain temperaments, give service for years, but that it is a devitalized tissue, remaining in its position alone, as it were, through favor. Agreed that research should extend rather in the hygienic direction, as suggested, and, so far as its dento-manipulative causes were concerned, would offer for what they might be worth, his mode of procedure, when attempting the destruction of the pulp of a tooth, in order to prevent the too often attendant evil. Esteemed that he had been most fortunate, and his source of good fortune might be presented in very few words. After treatment of the pulp, always plugged up his cavity with some substance saturated with creosote. Had found that creosote, through its alterative or stimulant properties, acted the good Samaritan's part. In the treatment of abscess used morphia, plugging up the cavity so that on the occurrence of trouble, the patient could remove the cotton or whatever it was composed the plug. The Dr's remarks were extended to some length.

Dr. Daniel Neal.—This hygienic seems the proper direction in which to employ our attention, for, have we no disease, we want no remedy, and the quaint saying of poor Richard "that an ounce of prevention is worth a pound of cure," is here peculiarly applicable, or at least it so strikes us. Was forced from a long series of observations, to believe that the dentist held generally the key to this formidable disease. The contact of gold with a delicate membrane, from its conducting facility, opened the way to it in one direction; leaving diseased matter in a cavity led to it in another direction, and so on, many other excitants of which, was it necessary, mention might be made, and over which the dentist holds supervision.

Cleanliness, he remarked, was next to godliness; certainly, in dental therapeutics, was synonymous with salvation. In treatment, and particularly where a nerve cavity was concerned, exerted himself to the observance of this law. Was tempted, indeed, to believe it the *sine qua non.*

When, however, a case of alveolar abscess presented, his treatment, in part, was about the mode pursued for its prevention. Removed the decomposed animal tissue, getting as near the apex with the excavator as possible, taking away every thing causing fetor, and, through the medium of the syringe, endeavored to complete and perfect the purifying process. Thought that no abscess, however severe or alarming, should throw the dentist from his equilibrium. Extracting instruments were the very last in his pharmacopœia. Believing that judicious treatment might often save, and that tooth life, like human life, was of sufficient consequence in most cases, to command every exertion.

The Dr. mentioned several very interesting cases of alveolar abscess which he had successfully treated. In one case (that of a lad) the tooth and parts were so affected as to discharge at least a thimbleful of pus, and ultimately, the tooth became so loosened as to have permitted its removal with the fingers. It being, by reason of its position, of much use to his patient, felt compelled to use every exertion to save it. Treated it with camphor and cleanliness, and in ten weeks had the satisfaction to find it sufficiently firm to allow of its being filled with gold, which operation was performed, and the tooth has since remained useful and entirely comfortable, a year having passed. Mentioned this last as an extreme case, and thought the members would agree with him, that if the disease thus progressed, was conquered, it was sufficient reason to warrant exertion in any and every case.

Prof. J. D. White coincided with the views of Dr. Neal. Urged the necessity of the purifying process. If such a law was more closely observed, thought that in more directions than this one, the dentist would have reason for self-congratulation. It was the foundation law of health, and without such a corner-stone, strength could not be given the edifice.

Prof. Flagg alluded to the causes of abscess. Has often remarked the disease as resulting from an imperfect dental operation, and particularly where, in the attempted filling with gold of nerve cavities, the canal has not been plugged. Another fertile source was the setting of pivot teeth. In this direction, his experience has been that where arsenic is used to destroy the nerve, alveolar abscess is an almost certain sequence. As regards the nature of the disease, viewed it as a deep-seated ulcer, and pursued similar treatment.

Prof. Parry.—Has had much trouble. Never yet found a remedy anything like universally successful. The most successful ever yet employed, is now using. Is beginning to rest strongly upon it, and has had the happiest results. Uses chloroform freely about the abscess. If able, injects both through the foramen and abscess. When able to employ it in this last way, feels very confident.

President Townsend.—Will Prof. Parry give us his theory of the action of the agent?

Prof. Parry.—It acts both as a stimulant and alterative; acts similarly to nitrate of silver on diseased flesh.

Dr. Harris.—As other gentlemen had given their mode of treatment when meeting with the disease, would offer that adopted as a general rule by himself. Endeavors, with injections of nitrate of silver, from 10 to 30 grains to the ounce of water, to break up the disease as in other parts is attempted with escharotics; when necessary, cuts away surrounding integuments to as near the seat of disease as may be done with safety, that he may the better inject; mentioned, among others, the case of a lady where three roots of the same tooth were involved; the palatial fang was discharging its matter into the cavity of the mouth, and the two buccals outwardly; removed all the diseased matter possible; conquered the disease with the nitrate of silver, as alluded to; the tooth of course was dead, but served the patient without further annoyance for a series of years. The Doctor, in the continuance of his remarks, viewed the pathology of the disease at length, and referred to several cases to which he applied the name idiopathic.

Prof. Arthur.—Alveolar abscess never results from causes entirely constitutional; had never met a case where the predisposition had not in some degree a local origin. Any particular point to be effected must have in itself some weakness rendering it less able to resist disease than its neighboring parts; did not rise, however, to discuss the question, but desired to offer some few remarks on its plainer causes. When a tooth receives a blow, depriving the pulp of vitality, the dead matter is absorbed through the tubuli, exciting periosteal inflammation. As a result, we are tolerably sure of alveolar abscess, if an immediate and proper treatment is not adopted—a treatment very simple in itself, and with which all, of course, are familiar, "that of opening into the pulp cavity and removing the matter," &c. In regard to alveolar abscess resulting from treatment of the pulp with arsenic, in ninety-nine cases out of the hundred would attribute it to the carelessness or unskillfulness of the operator; from close observation, was convinced that facts would bear him out in this assertion. Nerve cavities are, as a general thing, too hastily prepared, the filling of gold too quickly succeeding the arsenical application. To remove the body of a pulp from its chamber is generally an easily accomplished task, but it is in the canal of the roots that we have our trouble; and to fill over the dead matter there contained is, in many cases, the cause of disease. Such, indeed, is the susceptibility of the periosteum to disease, that the absorption of decomposed food allowed to remain in a nerve cavity, will excite inflammation; cited several cases illustrative of the various causes, which were possessed of much interest and bearing on the subject.

Prof. Buckingham.—If using nitrate of silver at all, would use it strong; it might discolor, yet inclined to believe the tooth would soon resolve back to its original color; would, however, as previously remarked, prefer the use of creosote, because it does the work of the silver, yet has none of its objections; as a vapor it penetrates through the foramen, exercising its caustic alterative and stimulating effects on the part involved, breaking up disease and exerting to healthy action. Concerning constitutional predispositions, if it is remembered that a part once

truly inflamed is ever more liable to be attacked than other parts, we may have an explanation in part of systemic influences centering on some particular tooth of the thirty-two, or however many there may be in the mouth; as referring back, we may remember the tooth involved as having at some previous time been the seat of disease.

Prof. Arthur.—Abscess resulting from pivoting teeth will be explained by my previous position, as I incline to believe—the non-removal of the entire nerve—and under any circumstances while this is allowed to remain all treatment is useless. The Doctor alluded to cases of abscess he had met, in which the pulp seemed not in the least involved.—*Ib.*

ARTICLE VIII.

Adjusting Lower Plates.

Messrs. Editors:—In the October number, 1855, of your *valuable* journal, I find a communication from "A Subscriber," with remarks from Dr. White, respecting the adjustment of lower plates; also one from Dr. Goddard in the January number, 1856. Dr. G. very justly remarks that "every member of our profession has his own peculiar method of adjusting plates." As for myself I can claim no very great amount of *unassisted*, practical experience in the adjustment of lower plates; having been in practice away from my preceptor, (Dr. E. P. Byram, of Cooperstown, N. Y.,) only about a year. During the six years I was with him, however, I claim to have seen and assisted in the adjustment of as many complete sets of teeth as usually falls to the lot of a student in dentistry. In that time we (*I* must say *we*, for I had a hand in them all,) adjusted over one hundred lower plates, of which all but one had its mate, the upper plate; and that one never gave satisfaction until it

was entirely made anew for the third time. Out of the whole number, we put springs on but one; that was for an old gentleman of sixty years.

We had, perhaps, six of the lower plates to make over, which Dr. Byram attributed to the plates being inserted before absorption of the gums was complete. I will give his manner of adjusting lower plates.

One of the most essential things—and the failure in which is the "rock on which many split"—is to get a *perfect* impression; that is oftentimes a most difficult thing to do, as the wax will in some cases suck itself entirely out of shape in coming off.

To prevent this, in the holders are pierced three small holes of a size to permit the passage of a common broach; one is in the centre of the holder, the others on each side and about one inch from the centre one. Before taking the impression from the jaw, pass a broach through each passage until it touches the ridge of the jaw; that counteracts in a greater or less degree the atmospheric pressure, and as a general thing, the impression, with care, can be taken off undisturbed. Get up the male cast from zinc, the counter-cast from lead, and swage the plate as thick as is possible. I generally use three or four female casts before I get the plate properly swaged. I always want to see an under plate fit as nicely to the jaw as an upper one. If by pressing on one side of a lower plate, the opposite would rise, I do (and when with Dr. Byram *had to do*) the work all over until it was a perfect fit. Every dentist knows that in most cases the lower plate has to be very narrow. Dr. Byram used to tell me, "in making an under plate to cut it until I thought I had spoiled it, and then file off a little more." After trying the plate and being satisfied that the fit is perfect, and that the ordinary movements of the tongue and loose integuments of the mouth will not displace it, proceed to solder around the anterior edge, the half-round wire, and the job is ready for mounting the teeth, which is not the least part of the operation by any means. I consider perfect articulation one of the most essential points in the well fitting of an under plate, especially in mastication.

Another cause of so much trouble from lower plates arises from the great haste which many persons show to "have their teeth" before absorption is half complete, and in some cases actually forcing their dentist to insert the lower plate when he knows that in so doing he is inflicting an injury upon them, and a still greater one upon himself. Much can be said upon adjusting lower plates, and I hope we shall be favored with as many articles on the subject as we have upon plate springing, alias "mysterious twistification."

Before I close I must relate to you a demonstration of genius that does not occur every day. While I was with Dr. Byram, we made a complete set of teeth for a hale, stout, old farmer, by the name of W. After he received the teeth he started for home fearful that he should never learn to use them. Some six weeks afterwards, a neighbor of Mr. W. was in the office, and told us that Mr. W. eat chickens and chicken's bones with his teeth; and furthermore, he had made himself an extra set of teeth for *general use.* The next day Mr. W. himself made his appearance, and sure enough he had made himself an extra set, and had them in his mouth. He had cast them in sand from block tin, using the ones we made him for *moulds.* Both plates were perfect in their fit, and their articulation was beautiful. I often tried to get the Dr. to tell you of it, but he being of a *retiring* and modest disposition, declined.

Respectfully, yours,

M. B. PATTERSON, *Dentist.*

Saint Paul, Minnesota Territory. *Ib.*

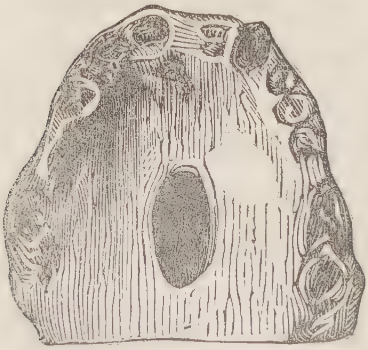
ARTICLE IX.

On Fissure of the Hard Palate. By A. G. Field, F. R. C. S., late Surgeon to the Royal Sea-Bathing Infirmary, and Demonstrator of Anatomy at St. George's Hospital Medical School.

The great difficulty of closing openings in the hard palate, when caused by disease, is admitted by all surgical writers. Even Mr. Fergusson who has done so much to improve the operation of staphyloraphy, while he recommends perseverance in the endeavor, states, that though he has tried the plan of operating suggested by Dr. Warren, of Boston, in several instances, it has always been without success. Mr. Erichsen, in his "Science and Art of Surgery," also states, "This operation has not, I believe, been hitherto successful in this country, and, indeed, been but little practiced, but yet it deserves attention, and holds out a prospect of eventually proving successful in cases of this kind."

The following case not only illustrates the difficulties and disappointments which are liable to attend the operation, but also points out a means by which ultimate success may be attained.

Mrs. G., aged 47, has had disease of the palate and separation of a considerable quantity of bone, on recovery from which



an opening was left leading into the nasal fossæ, situated about the middle of the hard palate, and large enough to admit the little finger. The parts have been soundly healed for some months, and she is in good health but experiences much inconvenience from the defect. Her voice is nasal, and it is necessary constantly to wear a plug, to prevent the passage of food and fluids into the nose.

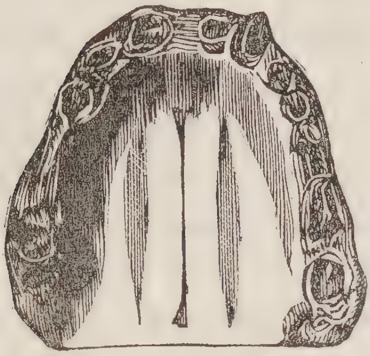
April 15th, 1856.—I tried with the assistance of some medical friends, to produce congelation of the palate, by means of salt and pounded ice, but in this we totally failed, even after more than an hour's perseverance. Our failure is to be accounted for, I suppose, by the high temperature of the parts and the currents of warm air through the mouth and nose, to both of which the freezing mixture would be exposed. Had I succeeded in getting the parts frozen, the advantages to be thereby gained are obvious. All pain would have been saved to the patient, during an operation which might have been accomplished in a very short time, as no interruption would have occurred from hæmorrhage, which gives rise to one of the principal difficulties in plastic operations in the mouth.

Failing in my endeavor to produce congelation I proceeded to operate according to the method of the late Dr. Warren. Having carefully removed the edges of the opening with a small scalpel, an incision of a little more than an inch in length was made, from behind forwards, quite down to the bone on each side, and about half an inch external to the fissure. The soft parts included between these two incisions were then perfectly separated from the bone, by means of an instrument which I will presently describe. When this was done, the flaps so formed by the detached soft structures met together over the opening, where, as soon as bleeding had been arrested by freely bathing with iced water, they were retained by three sutures introduced in the manner practiced by the late Mr. Avery. After the operation was completed one small artery bled freely, and required sustained pressure with the point of a finger to arrest it. The sutures we allowed to remain in five days, during which time the patient abstained from solid food, but partook freely of beef-tea, porter, etc.

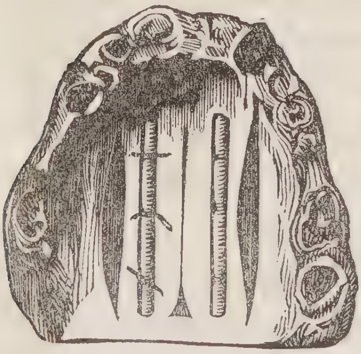
The result of this operation was a considerable diminution in the size of the opening, but when the parts had quite cicatrized a hole remained of about half the original size.

June 11.—The operation was repeated, but this time the edges were pared obliquely, the mucous membrane of the nose being removed on one side, that of the palate on the other, so

as to allow the edges to overlap each other, whereby a larger extent of raw surfaces were brought into mutual contact. I also used the quilled suture, instead of the simple interrupted suture, which had been employed in the former operation. This interfered less with the circulation in the flaps, while it afforded them more perfect support. After the second operation a hole still remained, about as large as a pin's head. This I tried to close by cauterizing with a hot wire, but as nothing was gained by that, after the cicatrix had formed, I brought the parts together on the 30th of June in the same way as before, in addition to which I supported the flaps in contact by well stuffing the lateral incisions with cotton wool. When the sutures were removed, six days after complete union appeared to have taken place, and I was just rejoicing in my success when I observed a small discharge of mucus, which, on more careful examination, I found had passed from the nose through a minute fissure. In a few days this increased, a little ulceration took place, and at the end of a fortnight the opening was considerably larger than before the last attempt to close it.



17th.—I performed the fourth and last operation, my patient cheerfully submitting, being encouraged by the comfort she experienced from what had already been accomplished. This time I proceeded with, if possible, more elaborate care than on the former occasions, and having completed the other steps of the operation in the same way as before, I carefully dried the parts and washed them over with a solution of gutta percha in chloroform, and then adapted a thin sheet of gutta percha over the whole surface. This I did because I believed failure in my previous efforts to obtain complete union depended on a portion of mucus being drawn from the nose between the edges of the flaps in the act of swal-



lowing, which it is impossible for the patient wholly to avoid. This belief was strengthened by observing, after the failure of the third operation, that the shred of mucus was drawn further into the mouth after each time the patient closed her mouth for the purpose of swallowing the saliva which collected in it, while it was held open for examination; and I imagine it occurs in the following manner:—When the first part of the act of deglutition has been accomplished, and the morsel has passed beyond the reach of the tongue, the upper surface of that organ is left accurately applied to the roof of the mouth, and its return to the position it usually occupies is effected by the genio-hyoglossi muscles, which being inserted near to the median line would, by their contraction, depress the middle of the tongue first, while its sides were still in contact with the palate; by this means a degree of suction would be produced whereby the loose edges of the flaps would be liable to displacement and to have the nasal secretions drawn down between them into the mouth, preventing union of their surfaces, however accurately they may have been adapted. Whether my explanation of the usual cause of failure when this operation has been performed be correct or not, I submit to the decision of more competent judges; but certain it is that I had the happiness of completely accomplishing my object, the removal of a very distressing annoyance to this poor woman, for all that now remains to be seen in her palate is a linear cicatrix in the situation of the opening which had caused her so much trouble, and a broad scar on each side, caused by the gaping of the lateral incisions, which were rapidly filled up with granulations and covered over by mucous membrane.

The instrument which I have found most useful in detaching the soft parts from the hard palate is here represented. It differs from those used by the late Mr.

Avery, in having the blade set on obliquely, so that it allows the flat surface to be applied against the palate, while the handle and hand of the operator are free of the lower jaw. The bend in the neck of the instrument is also advantageous in giving the operator more perfect command over the movements of the blade. With such instruments (a different one being of course necessary for each side) I have always been able to accomplish the most troublesome stage of the operation with ease and rapidity.

28 *Old Steine, Brighton, July* 30, 1856.

ARTICLE X.

Treatment of Dental Caries when Complicated with an Irritable or Exposed Pulp. By James Taylor.

In our last article on this subject, which was published in the January number of the Register, we particularly confined our remarks to that condition which immediately precedes exposure of the pulp.

We would here remark, that to avoid lengthening these articles unnecessarily, we have confined ourselves to our general practice, and hence have not referred specially to what has been written by others on this subject. We do this the more freely, because we do not claim anything in our practice as original or different from what may be pursued by many others. We have tried, however, to simplify the subject and have aimed to present it in such a form as to benefit the young practitioner.

We so often meet with teeth which have been grumbling and troublesome for weeks, and sometimes months, and which have been condemned by young practitioners, that we were somewhat careful in our last to put them on their guard and not consider the nerve exposed unless they have positive evidence of it.

We come now, however, to that condition of the disease when

the pulp is really exposed, and first speak of the treatment to preserve the nerve alive, and second to preserve the tooth by destroying the pulp.

When on excavating the carious portion of a tooth, we completely uncover and expose the pulp, we at once decide on the practicability of preserving it, by reference to the general irritability of the dental organs, the constitutional temperament of the patient, and whether the tooth has already given trouble.

If the general irritability is such, as to be materially affected by extremes of heat or cold, and the constitutional temperament, such as generally tend in such cases to the formation of alveolar abscess, and the teeth has shown symptoms of disquietude, we regard it as an unfavorable case.

Every dentist of observation, must have noticed that there are a class of patients, who on all occasions, where the disease has reached the nerve, are having swollen faces and abscess. This may indeed be called a constitutional tendency. There is another class of patients whose teeth decay and break away, and who yet scarcely ever complain of *tooth-ache.*

The former we generally find of a nervous temperament and strumous habit of body. The nervous system is too high strung to bear the least excitation, and the muscular tissue not energetic enough to repel the attacks of disease, it needs a repelling and recuperative power.

The latter generally possess a firm constitutional habit of body. The sanguineous and sanguino-bilious. The powers of the system are well balanced, and if the nerves do become excited, the general energy is such as to give them room for play, and then restrain them in proper bounds thereafter. The same operation in one will prove successful, while in the other it will fail.

When the pulp is perfectly healthy, no special preparatory treatment is necessary, and when diseased the chance for success is very much lessened. True, it may be in an irritable condition and this irritation subdued, yet inflammatory action is more apt to be brought on from slight causes thereafter.

If the case is a favorable one, such as we have described, and

in excavating the decay, the pulp organ has not been wounded, we proceed with the operation at once. The first thing to be done is to make an easy opening into the cavity, plenty of room should be procured for perfect manipulation. The carious portion should be thoroughly removed, and we prefer marking out on the base of the cavity, with the excavator, a perfect floor or basement to receive our cap. The cap is then made of gold plate and adjusted to the place formed for its reception. We then heat it over a spirit lamp and cover the surface, which goes next to the pulp, with a thin layer of Hill's soft filling. The cavity is then washed out with tepid water, sometimes first with a little creosote or spirits of camphor. Then perfectly dried and the cap adjusted, after which blocks of foil, or cylinders as they are now called, are adjusted around the walls of the cavity with their ends resting on and confining the edge of the cap to its place. We desire and aim to have this cap leave as little space between it and the pulp as possible, without any pressure on the nerve. A space here which must be filled with atmospheric air, or secretions from the pulp organ, we consider pernicious and a cause of many failures, for they are irritants.

It will be recollected that we are giving our usual practice, and that which has been as successful in our hands as any other. In some small and superficial cavities, we make our caps of a few folds of gold foil, and cover its lower surface with Hill's soft filling as in the former case. Oil silk may be used in the same way. Beeswax, which is a non-conductor, may also be used in the same manner. These non-conductory materials are used merely as preventives of after trouble, yet we do not think they are always absolutely necessary. If cold or heat has not been a source of annoyance previous, or at the time of the operation, they will not often be afterwards.

Of late we but seldom attempt to cap and preserve the pulp alive after its exposure, unless in the front teeth, or when we have the favorable circumstances to which we have alluded. In the front teeth we prefer the preservation of the pulp with particular reference to the color of the teeth. In decay on the approximal surfaces of the front teeth, we often have an expo-

sure as it were of the side of the pulp. The integrity of the pulp organ has been but little impaired. When this is the case its preservation is essentially important, for its circulation through the healthy dentine, may still be maintained and the tooth retain all its living characteristics. This is a condition of things in which we would institute remedial treatment if necessary to prepare such teeth for filling.

The pulp may be thus exposed to the effects of caries, and have shown considerable symptoms of irritation, such as pain on the application of heat or cold, pain from pressure of foreign substances, uneasiness from exposure, &c., &c., and still be restored to health and preserved without much trouble.

The first indication here is to remove the carious portion, for this is the direct source of irritation. After this is accomplished, the cavity should be washed out with tepid water. If the blood vessels appear to be engorged with blood, a slight scratch causing a little hemorrhage, will often be of service. This can be checked with an application of creosote or spirits of camphor. We prefer the former, generally, because of its antiseptic property, and from the fact that it relieves the pain instead of increasing it. We more frequently apply in such cases creosote and tannin on a pledget of cotton, let it remain while we fill perhaps one or two cavities, then remove our application, dry out the cavity and fill. In other cases when we have much irritation, we allow the creosote and tannin to remain twenty-four hours, and if the irritation is not completely subdued reapply. In cases, when admissible, a lead cap may be adjusted over the pulp and the cavity dried out and fill with adhesive wax. Care should be taken that pressure is not made on the nerve, and acid fruits, pickles, vinegar, &c., should be *not* used until after the operation is completed. If the gums are inflamed or turgid about the tooth, they should be freely lanced and indeed aching teeth, roots, and diseased gums should be promptly attended to as preliminary to the operation itself.

But we may be asked, if after all this trouble and the tooth is filled, it should ache, what would you do? In the first place, should the pain be but slight, we would direct counter irritation,

with chloroform, tincture of arnica, camphor and laudanum, &c. If these fail, freely lance the gums and apply leeches, and finally administer a saline purgative, and if nervous restlessness supervene with diminished pain, administer six to ten grains of pulvus doveri. If these remedies should fail, take out the filling and destroy the nerve.

This leads us to the last part of the subject under consideration, which is the destruction of the nerve and the preservation of the teeth.

We rejoice to know, that however desirable living and healthy teeth may be, yet dead ones are far better than none, and that true science is claiming a victory over the forceps and mechanical dentistry. Yes! when we now stop to reflect, we can count numbers who are now rejoicing over and enjoying a fair set of natural masticating organs; who, but for this victory, would be ruminating over suction plates and artificial dentures.

As preliminary to our remarks on destroying the nerve and filling the teeth, we wish to make two or three remarks. The first is, that every tooth with its pulp exposed, ought not and should not be preserved. There are crowded dentures that need relief by the judicious application of the forceps, and there are teeth having no antagonists that should be removed. In the second place, there are teeth affected with exostosis, and where wasting of the processes and disease of the gums, require that they should be extracted.

Every judicious operator will take a careful survey of the mouth before he commences to operate or decides upon what teeth should be lost.

There are cases, however, and not very seldom either, where an aching, ulcerating tooth, is of far more importance and real value, than half a dozen of sound ones that may be in the mouth.

We will illustrate this by giving a case. About a year since, a gentleman called to consult us about having out his teeth and getting a new set. A lower molar and dens-sapientia which were but little decayed, antagonized with an anterior and posterior above, which were badly decayed, the pulp exposed in one and the other discharging matter from the nerve cavity,

both were frequently aching and had been condemned two years before as past recovery. The first bicuspid of the same side, superior, was decayed near the nerve and antagonized but imperfectly with the cuspid below. The latter being somewhat out of its proper place. The bicuspids on the other side above were out, and the only means of masticating on that side, was the anterior molar, which had come forward and downward, until it struck the posterior part of the posterior bicuspid below.

The cuspid and lateral incisor of this side above, were both worn down and decayed, until their nerves were exposed. Now to have taken out the three teeth with exposed nerves, and the ulcerated one, the only masticating organs left, which could be of much use, would have been four front teeth above and their antagonists, virtually the loss of the diseased organs was the loss of the entire set.

Here was a fine case for the forceps and a new set of teeth; yet there was another question of far more importance than dollars and cents, which was, shall surgical or mechanical dentistry claim the pre-eminence. True science points to the former, the mechanical dentist claims the latter, and yet there can be no doubt but even such a set of teeth well preserved, are of far more real service, than the best artificial dentures. We have the pleasure to know that this gentleman retains his teeth, and that they answer all the purposes of good natural organs. But for the treatment necessary to this result.

The first thing is the destruction of the nerve. The agent to accomplish this, is almost we believe, universal with the profession; arsenic, in some form or other. Some thirteen to fourteen years since, when this great remedy was being introduced as a great secret to the profession, Dr. Rostaing and ourself commenced a series of experiments to find out what it was. Arsenious acid was then used with powdered charcoal and morphia. Its black color led us to suppose it might be cobalt, and this we tried and soon found we had the agent, although in a different form from that then used. But after many experiments with various combinations of arsenious acid and other substances, we have thrown aside all other forms, and simply

use cobalt of the shops in a finely pulverized form. We believe it acts more mildly and full as efficiently as any other.

The first thing to be done, is to remove the decay so as to expose the pulp, and give room for the application in the cavity of the tooth. If the pulp is exposed and the cavity sufficient to receive the application well, no special benefit is derived by removing the decay. The object is to bring the cobalt in contact with the pulp. To accomplish this, we take a very small piece of cotton, and roll it up on the point of an instrument, touch this cotton to a cork from a vial of creosote, the cork having been wet with the creosote, this simple way of moistening the cotton avoids the too free use of the creosote. The cotton is touched to the cobalt, and the surface being moist, retains a sufficient amount of cobalt, which is then carried to the cavity and laid over the pulp, over this may be placed a cap of sheet lead, and then the cavity sealed up with adhesive wax. This should remain in the tooth some ten hours, although we often leave it in for twenty-four; usually, little if any pain is experienced, and generally the nerve is found dead. We now remove the remainder of the carious portion, and enlarge the opening into the pulp cavity. If the decay is on the approximal surface of the incisors, cuspids, or bicuspids, access can be obtained pretty well, by cutting tolerably freely on the lingual face of the teeth. This we regard as the first and important step in the operation, for without easy access is made to the cavity in the fang or fangs, the whole operation is rendered difficult and uncertain. This is the point where most beginners fail.

Within the last month we have had a superior molar to treat which had been under treatment three weeks, and yet all the remnants of the nerve and blood-vessels were not removed from the nerve cavity, and hence soreness remained; and the simple reason was, that it was impossible to get into the cavities thoroughly. As soon as we cut away the tooth and removed the foreign and dead matter from the roots, soreness and discharge of matter passed of, and the tooth was soon filled.

But we do not wish to be understood as saying, that one application of cobalt will always be sufficient, and that no pain

will ever be experienced to give trouble, for such is not always the case. After the first application, however, the nerve is much paralyzed, and often if not thoroughly killed, it may be caught on the end of a broach and removed entire without much pain, when this can be done we prefer to do it. We take a watch-makers broach of small size, and heat it to take out the temper, this will allow it to bend to suit the condition of the cavity, and permit it to be turned as it enters the root. As we turn the broach round and round between our forefinger and thumb as it enters the cavity at the root, we can often feel that the nerve is being twisted on its point, some little pain may thus be given, yet not enough to cause much flinching. In withdrawing the broach, the nerve will often be attached, most likely some discharge of blood or bloody matter, will follow the operation, we let this pass off. Then with a few fibres of cotton wound around our broach, wipe out the cavity, or throw up with a small syringe some tepid water. If the nerve cavity is very small, we enlarge it sufficiently to clear it of all extraneous matter; but usually the cavity is large enough. The question now naturally arises, shall the fang be filled at once, or must we wait to see if any discharge ensues. If the tooth is free from soreness, and after wiping out the cavity with a few fibres of cotton wrapped around the broach no blood is perceived, the cavity may at once be filled. If, however, there has been some inflammation involving the periosteum, we moisten the end of a soft thread with creosote, and having attached this to the end of our broach, carry it to the end of the fang, and pack it in firmly as a *test* temporary filling. The end of the broach will catch the fibres of the thread at its end, and by a few turns secure it sufficiently firm to be carried to the point desired; in introducing this, however, we make two or three turns of the broach as it enters the dental canal, to be withdrawn, the broach must be turned back, so as to unwind the thread. We are thus particular, because many have difficulty at first in this simple operation. After packing the thread in the canal, we cut it off and leave the end loose in the cavity of the tooth, then fill up the cavity with beeswax, and let the whole remain for one day. We then re-

move the wax, catch the thread on our broach and it is easily withdrawn. If this plugging up should cause pain, the thread should be withdrawn before inflammation of the periosteum takes place. If merely slight soreness by jarring of the tooth is felt, we recommend rubbing the gums around the tooth with tincture of arnica, chloroform, or camphor and laudanum. This will generally subdue the pain or tenderness in a few hours. If the tooth is free from soreness, and no bloody matter comes away with the thread, the fang is ready for filling.

Should the plugging up of the root with thread cause soreness of the teeth, pain, &c., the nerve cavity should be opened by its removal; yet we re-introduce a little cotton or thread loosely, and this is moistened with creosote. The next day this is removed, and the canal thoroughly cleansed, and the thread with a little creosote introduced a little tighter. This is renewed every day, and each day made tighter and tighter, until the tooth bears it without pain, and when it is removed no flavor of pus is perceptible on the thread. During this treatment, external applications are made as counter-irritants to the gums. A few days is generally sufficient for the treatment of what might usually be called bad cases.

We have, however, had a few cases which never would become quiet with a temporary filling of thread, and what is equally remarkable, they have *invariably* been satisfied when fed on gold. The first case of this kind, we had been treating for a month, several times the tooth became so sore that we threatened to take it out, yet in a few moments after the thread was removed pain ceased, and we could try it over again, lancing the gums, &c. &c., to keep down the inflammation; at last we got tired of the job, and concluded we would fill the fang, and if it ached remove the tooth. The first roll of gold introduced, gave some pain which soon passed off, and before the filling of the fang was completed, the gentleman remarked, "that feels right," and save a little tenderness on being jarred for a few days, has never troubled him since. We have had in all, perhaps, a half dozen such cases, and yet have never had to extract one of such teeth, and to our best recollection, not one case produced abscess.

We have had two or three cases, which arsenic would not kill, and we tried the pure stuff. In one case after four or five applications, and we had only got a short distance above the neck of the tooth, we waited a day or two until soreness subsided, and with a roll of foil the size of the dental canal, forced it up as near the nerve as we could without giving pain, then filled the tooth. This was five or six years since, and the gentleman has the tooth yet, and it has never given him pain.

We allude to such cases and the result, to show how successful the most undesirable cases will often terminate.

We have observed that the most of these cases, which were disposed to resist the action of arsenial preparation is, were superior cuspidati; within the last few days we have had one which gave us some trouble. This cuspid we had filled last fall, and it remained quiet until about a month or six weeks since, when it commenced to pain. We removed the filling and found that a filament of the nerve had been exposed, and which had escaped our observation. We then applied cobalt and the lady left for St. Louis, and returned only a short time since. We found, however, that the application had not destroyed the nerve, and we made two or three applications before we could introduce our probe into the dental foramen, and then only at most a line. We then applied the cobalt direct to the nerve and sealed up tight with wax. The next day, the nerve was as quick as ever. We however, determined to carry our broach some distance up the canal, even at the risk of some considerable pain. This partially broke up the nerve, and one more application of the cobalt finished it. We this day filled the fang very satisfactorily.

There is yet a class of cases to be considered, which require a few remarks before dismissing this subject. These are cases where the pulp is already in a state of suppuration. We embrace in this class of cases, all from those in which the pulp is just undergoing decomposition, and the opening of the dental foramen, lets out bloody matter; to those which have been discharging for even years and where the closing of the canal, unless this disease is removed would, certainly ultimate in alveolar abscess.

There are many cases where the pulp has been destroyed by the action of dental caries; violent tooth-ache may have been the consequence at the time, yet after the nerve has been destroyed, the pain ceases, because the small amount of discharge which is thrown off at the apex of the fang, finds an outlet through the dental canal, close up this natural outlet, and pain and abscess is the consequence. An old method to get rid of this difficulty, was to drill into the nerve cavity under the free margin of the gum. But, however successful it may have been as a relief to the pain after such teeth had been filled, yet the disease is still there, and at best the operation is a very unscientific affair.

In the treatment of all such cases, our aim should be to remove the disease, and then save the tooth; and in the treatment of this disease, the first thing to be done is the complete removal of all irritants. We have before remarked, that we regard all foreign matter in the nerve cavity, as that which most directly keeps up this disease. In the treatment, therefore, the first thing to be done is to open perfectly the dental canal and remove all the diseased bone, and by injections of tepid water, or by some of the chlorine preparations, completely *disinfect* the cavity. We say chlorine preparations, because almost any of them will answer the purpose. We use more frequently than any other, chloride of zinc in solution. The fact is, our general treatment to arrest the disease is, first wash out with the chloride of zinc where there is much discharge, and then apply the creosote as heretofore directed.

Very offensive matter may be discharged for several days after the nerve cavity is cleansed out, and if the cavity is filled too tightly with cotton or thread, pain will be the consequence. If the discharge continues copious and offensive long, a solution of six to ten grains of nitrate of silver to an ounce of water, will be found invaluable as an injection, to be used however not oftener than once in two or three days, using in the mean time every day the pure creosote on the cotton or floss silk. After the discharge has in a measure ceased, which can be told by the absence of its order on the thread or cotton which has been used, the

thread should be pressed in more and more solid. If the case has been of long continuance and has required much treatment we plug up very firmly with the thread and leave it in two or three days, and should only slight uneasiness and soreness of the tooth supervene, we leave in the thread and treat by lancing the gums, counter-irritants, &c., as before recommended.

When this soreness has subsided, we fill the nerve cavity and let it remain for two or three days and then fill the crown. We may with propriety, refer to our mode of filling the nerve cavity. We first roll on a broach, which gradually tapers to a point, a cylinder of foil about one-fourth of an inch long, as near the size of the nerve cavity as we can, this is rolled hard, and when the broach is withdrawn resembles a gold wire. This is introduced into the cavity with our plugging plyers or forceps, and then with a blunt-pointed slender instrument which can be easily introduced into the cavity, the cylinder is forced to the apex of the fang. Then another and another of like character is thus introduced and forced to its place until the cavity is completely filled. We are indebted to Dr. Clark of New Orleans, for the mode of making these cylinders. These cylinders by the way, are identical with the block which we recommended in the first series of articles which we published on the filling of teeth, excepting indeed, in the mode in which they are made. The mode of filling the crown with cylinders or blocks, which we are glad to see is attracting much attention of late, is the same as that recommended by us in our first article on this subject. The operation of filling with blocks or cylinders by some may be considered the same as that taught by a gentleman of the name of De Ware, several years since; but his mode as far as we can learn, was to roll in small balls the foil, and that without any special system, and these were introduced with ordinary blunt and sharp pointed instruments, commencing at the bottom of the cavity and packing in ball after ball, until the cavity was filled, the arrangement of the gold in parallel lamina and inserting it as so many wedges was entirely different. Any method of introducing gold for filling requires much manipulation to become adept in, yet new beginners can certainly learn that by the use

of blocks as readily as any other, and when once mastered in all its detail, we think it will not be laid aside for any other.

When we first commenced this method of filling teeth, it was in large central cavities. Its superiority soon induced us to try it in other more difficult cavities, the great difficulty, however, was, the proper instruments were not to be had. This difficulty was in a great measure overcome, by having made some five pairs of plugging forceps; long continued use has enabled us to throw aside two pair of these, and also more frequently fill up openings between the blocks, which may be made by the use of a sharp pointed instrument, with hard small sharp pointed blocks, which are forced in with serrated compressing instruments.

The treatment we have given for the preservation of ulcerated teeth, may be considered very simple and often withal too tedious. Yet such is not the case, for sometimes a single tooth may be worth to an individual hundreds of dollars, and so far as simplicity is concerned, it is in strict conformity with the known pathology of the disease, and the practice based thereon by our medical brethren generally, in the treatment of like cases of ulceration.

We believe that this treatment if judiciously pursued and persisted in for a reasonable length of time, as a surgeon would for the cure of an ulcerated surface on any other part of the body, that nineteen out of twenty of such teeth can be saved, and we see no reason why not, for many, many years. There may be some constitutional habits of body, such as scrofulous diathesis, or a scirrhous taint of the system, which would indicate the removal of all such teeth; yet we have not as yet met with them in our practice; that is, we have not seen injurious consequences result from such practice in the many cases we have treated; and yet, we have cases of diseased gums, showing such marked predisposition to fungous growth from dental irritation; that we unhesitatingly advise the removal of every tooth which is so far decayed as to involve the pulp organ; at least in such cases we would wait even in a front tooth, until the constitutional health and disease of the gums showed evident signs of restoration to health.

In the disease of the dental pulp, of which we have been treating, there is one stage further in advance, and which has generally been considered incurable; we mean alveolar abscess, and which has been so ably treated by Dr. Ballard, of New York, that we shall merely refer to his article, and which may be found in No. 2 of volume ix of the Dental Register. We would here remark, however, that although our success in the treatment of the cases to which we have alluded, has been far greater than our most sanguine expectations could warrant, yet we still had no thought of testing it in abscess in the manner recommended by the doctor. Still in cases of abscess, where too much of the root has not been denuded of its periosteum, we are satisfied the treatment will prove successful. The matter may cease discharging, and the abscess heal up, but that the sac at the end of the fang is removed, and the periosteum reunited to the root, is to us at least doubtful.

These articles on the treatment and filling of teeth, have occupied far more space than we anticipated, and yet we are now satisfied that a careful review of the subject would cause us very much to extend them.

The subject of exposed and irritable nerves, and the preservation of the teeth thereafter, is, of all others, perhaps, the most important one of dental practice, and would of itself, if treated with that accuracy, which would be perfectly satisfactory to the young practitioner, make quite a volume.—*Dental Register.*

ARTICLE XI.

Preparation of the Mouth for Artificial Teeth. By H. R. Smith, M. D., D. D. S.

Dear Doctor:

There is a subject which appears to me to be of great importance, on which very little is said through our public journals. Important, because one of our most common operations is de-

pendent upon it; and one which if not properly understood, will bring failures if not disastrous results.

It is a subject which even some of the older members of our profession pass by without due regard, and one which costs the tyro many years of practice, and many failures, to duly appreciate.

The subject to which I allude is the preparation of the mouth for artificial teeth, and the care to be observed after they are inserted. Too often do we find work failing and being thrown aside, not from any defect in the mechanical piece, but from the remaining natural teeth giving away, or gums receding from the artificial fixture. To such an extent has this been the case, that even some of our leading dentists are "down" on the mechanical dentist, and abuse not only the work but the operator.

I think this may all be referred to the fact of neglect in laying the foundation properly for the work. Of the importance of saving the natural organs, I will not speak, for all are, or should be aware that, such should be our greatest aim. But with all of our good operations, and salutary advice, many teeth will fail and substitutes will be called for.

The question then comes up, how shall we perform the operation to be of the greatest benefit to our patient? Here will come the test between the mere mechanic and the skillful operator.

It has been asserted by the "anti-artificial" dentist that a jeweler, or any other good worker in metals, could make a dental substitute. Such may be the case so far as outward appearances are concerned, but the "goodness" of an operation does not depend on that alone, but on the permanent value to the patient. And to insure that result, more than a knowledge of mechanics is necessary.

First, an intimate knowledge of chemistry is necessary, in order to understand the chemical action constantly going on in the mouth, which, by changing the fluids and particles of food, may destroy the natural teeth and membranes. And secondly, what action is produced when a metal is brought into connection with the teeth and these fluids.

A knowledge of anatomy and physiology is necessary in order to know the form of parts involved and the changes which take place from time to time in the alveola and surrounding parts; and of pathology and therapeutics, to understand what the changes are which are produced by disease, and what remedial agents may be brought to bear to restore the parts to health.

When these subjects are fully understood, then, and then only, can the good mechanic succeed in making his work good and useful.

Oftentimes do we have patients present themselves to have aching teeth and roots removed, diseases of the mouth and gums cured, teeth plugged and artificial teeth inserted, and all in the space of a few days or weeks, and too often does the "mighty dollar" tempt the operator to undertake the job. The work is done and the money is secured, and the conscience of the operator (if he has one) is quieted by the reflection that the work looked well and "paid."

Should it be any wonder that such operations fail? If they do not, it will not be from any science or skill of the operator, but from the power of nature to overcome difficulties, and more or less accommodate herself to circumstances.

It is a practice amongst very many of our first operators to insert what are termed temporary sets of artificial teeth, almost immediately after the teeth have been extracted. It is a practice which, under ordinary circumstances, I must protest against, for this reason: first, because there has been before, and will necessarily be after extraction, irritation or inflammation in the gums, and alveola and around the natural teeth if there are any. At this time acid and irritating matter is secreted, and the dental substitute will, if inserted, instead of lessening the irritation, tend to increase it. Galvanic action will be produced and evil results follow.

Another reason against temporary substitutes is this: When the work is inserted, it must of course fit the gums over alveola before they are absorbed. The pressure of the plate keeps the alveola adapted to it during the absorption to a certain extent, leaving them in a very uneven and irregular shape. Again, as

the alveola settles, the plate has an unequal pressure on some parts of the mouth, thereby keeping up a constant irritation.

And lastly, after temporary teeth have been worn for a time, they become badly adjusted, and often in this way habits of using the jaws are contracted which interferes very much with the good articulation of the permanent teeth.

I will here propose a few general directions by which we may avoid many of the evil results of which I have before spoken. In the first place, when a patient calls on me for advice and operations, I make a very careful and critical examination of the mouth and teeth, making up my mind as regards the pathological condition, and also what treatment I should propose to remedy the case. Then, if after informing my patient I have his approval, I carry out my plan in about the following system.

If there are any teeth which I propose to leave, I see that they are freed from all salivary calculus and foreign matter. Then I proceed to extract all decayed teeth and roots that cannot be saved by plugging. After the bleeding has subsided I remove all speculas of the alveola that would irritate the gums. As this part of the alveola would in time absorb, it is better to remove it at once by instruments and thereby hasten the process of nature. The gums are more comfortable and heal more rapidly and in better form. This I should invariably do in preparing for full sets. For unless they are removed, as the gums shrink away they project through the gums, keeping them sore for a long time.

The teeth all being extracted, if I find any other portion of the gums inflamed where the bleeding did not occur, I would bleed freely by the lance or leech, rubbing the gums briskly with the finger to facilitate the bleeding. After the gums have bled sufficiently to satisfy me, I rinse the mouth with a solution of tannin in water, which will arrest the flow of blood immediately.

This will constitute all of my operations during the first visit of my patient.

I next prepare a tonic and astringent wash composed of tinc. myrrh, cinchona, opium and orris root, to be used with water daily for some time, to keep up a tonic action in the mouth and keep down any traces of ulceration.

If there is any effect of salivation remaining, I also give them in addition a small solution of chloride of soda to counteract the effects of the mercury.

With the above, I recommend a constant use of tooth soap and powder to cleanse the mouth and teeth, with strict injunctions to be faithful in their use.

The above I always furnish my patients; for if I do not they are apt to neglect getting them, either from expense or carelessness. But if once they have them, they will generally use them according to directions.

I now dismiss my patients and direct them to call again in a few days.

At the next visit I remove any remaining traces of calculus and polish the teeth when it is needed, and if there is any inflammation existing I bleed the gums again, freely, and continue the lotions. As soon as all traces of inflammation are gone, I then proceed to plug the teeth, if they need it.

After this treatment, the remaining teeth are less liable to be sensitive than they would have been if plugged during the first operation, and more certain to be preserved by plugging. The directions to the patient should be strongly insisted upon with the reasons for so doing, otherwise they are liable to be neglected and the dentist will lose the honor of succeeding in his operations. For whatever the result may be, the patient will take no blame on himself; therefore, the dentist cannot be too strenuous in having his directions carried out.

The time necessary for the patient to wait before the substitute is inserted, will depend upon circumstances. For a temporary set at least one month, and for the permanent partial set not less than three, and full sets not less than eight months.

A very good guide in most cases is to wait until the furrow in the gum over the alveolar ridge is entirely obliterated before the substitute is inserted.

Patients are generally in great haste to get through, and to the dentist there is also something in the future to urge him to complete the work as soon as is possible. But the great object should be to perform such an operation as would be of the

greatest service to the patient, and in the end the operator will not only be remunerated by pay for the work, but a satisfaction of knowing that his patient is truly benefited.

One more direction I would urge, which is this: that all artificial fixtures in the mouth should be taken out, and it and mouth thoroughly cleansed, at least three times per day. To this rule I would have no exceptions, for unless it is done, food and foreign substances accumulate around the natural and artificial teeth which produces a powerful chemical action which must do mischief sooner or later.

There are other causes of failure of artificial fixtures in the mouth; one of which is, that many patients prefer to get the cheapest operations, by which they secure not only badly adjusted fixtures, but what is worse, base metal. When such is the case, patients should not complain if the operation fails.

But unfortunately the patient is not the only one who suffers from bad operations; for the good operator comes in for his share of the abuse showered on the profession generally, for the bad operations of one of its members.

That artificial fixtures in the mouth are often the cause of great injury is, I do not for a moment doubt, but I am confident that the most of those results are from causes mentioned and may, in a majority of cases, be remedied by proper precautions.

The young members of the profession are more liable to fall into the errors mentioned; hence, instructors and writers cannot dwell too much on the importance of the primary operations. Otherwise, our operations will meet the name they sometimes get, of being fit only for "show work," not for utility. Our motto should be, first, *utility;* second, *beauty.* Then, and not until we work to our motto shall we be entitled to the praise we covet.

QUARTERLY SUMMARY.

1.—*Cylindrically Prepared Foil.*—Dr. White, one of the editors of the Dental News Letter, in the April No. of that journal, gives the manner in which Dr. J. S. Clark prepares his foil preparatory to introducing it into the cavity of the tooth it is designed to be condensed. "He cuts the foil into strips, wider or narrower as may be required, and then folds it upon itself as a surgeon makes a compress, or as a bolt of cloth is folded." "He," Dr. Clark, "considers this preferable to rolling it on a narrow watch spring, as we have been in the habit of doing for years, in making flat pellets, on account of its allowing the air to escape from between the folds during the process of condensation." Dr. White then proceeds to state the manner in which he prepares it, which is by using a cushion—and by placing a blade of scissors in the middle of the strip to be folded and pressing gently upon the cushion—the edges of the strip are raised up, as the middle of the strip is depressed, which keeps the operation to bring the edges together, and continues in this manner folding the strip until it is of the desired breadth, making some wider or narrower according to the depth of the cavity to be filled; the folded strips are then rolled into cylinders by means of a watchmaker's broach, a little larger than a cambric needle; this instrument must be square, or five or six sided, to present edges to hold on to the strip while rolling." The end of the strip to be rolled, is taken between the thumb and forefinger of the left hand, and the point of the instrument placed on the end of the strip and pressed hardly upon it, and rotated at the same time to catch and hold the strip while rolling it." The cylinder may be made harder or looser, as may be desired, as the strip is allowed to escape from between the thumb and finger between which it is held.

Dr. White remarks, that a leaf of No. 4 gold, cut into three portions, makes convenient sized strips when folded, or No. 6 gold cut into four parts, and that if the strips, when folded, should be too heavy it will require too much effort to bend the strip, and that the needle upon which it is folded will tear the inner folds and its hold upon the strip will be loosened. These cylinders may be of all

sizes, between that of a No. 8 needle to that of a common quill. The lighter leaves make better cylinders than the heavy ones.

In placing these cylinders in a cavity, a large and loosely rolled one is placed in first, if a smaller one cannot be retained in its place, and then this cylinder may be pierced with a round pointed instrument and a smaller cylinder introduced into it, and so on until the cavity is filled, when the whole mass may be pressed well and filed off and polished.

Dr. White regards this method as invaluable in crown fillings.

The Dr. has found that the ends of the cylinders excite considerable irritation when they come in contact with sensitive dentine—which can be obviated, as he remarks, by placing over the sensitive part of the cavity a thin layer of folded gold before introducing the cylinders.

He remarks, that a plug of this kind is more readily polished and is not so liable to scale off in masticating as one which is made by using the gold in a coil.

2.—*Hypertrophy of the Gums.*—In the April No. (1856,) of the Dental Register of the West, a case of hypertrophy of the gums, the subject a patient of Dr. Gross, is reported by Dr. Goddard, dentist, of Louisville, Ky.

The case, from the description and cuts which accompany it, has points in common with a case of the kind published in an early number of the Journal, written by Dr. Koecker. The subject, which Dr. Goddard speaks of, was a lad aged about 10 years, of whose mouth the Dr. succeeded in taking an impression, the difficulties of which, were almost insurmountable. On looking at him, he presented the appearance as if his tongue were protruding beyond the jaws; but which upon more careful inspection, was found to proceed from the affected gums, which, projecting upwards and outwards, forced the upper lip against the nostrils, and greatly impeded respiration.

Dr. Gross remarks, that judging from the history of this case, there is great probability that it had existed from the birth of the patient. About the time the mother's attention was first called to it an abundant flow of saliva commenced, so irritating in its character as to erode the chin and other parts with which it came in contact. After several years this secretion diminished gradually in quantity and

in its acrid quality. "Almost simultaneously with the enlargement of the gums was observed an enlargement of the tonsils, leading to embarrassment of breathing, which has remained up to the present time." Both affections gradually increased, the general health being good. "About the fifteenth month the two middle incisors of the lower jaw appeared, and after sometime the corresponding teeth above. The gum, however, was already so large as to conceal nearly the whole of the organs," after which the inferior deciduous cuspid and first molar of the right side issued, and these were the only teeth that were ever visible, prior to the operation performed. Dr. Gross then gives the condition in which the boy was found by him, when first consulted upon the case. "His body was short but thick set, his eyes black, the pupils dilated, and the lids fringed with long lashes, the hair dark, the face pale and pasty, the head rather ill-shaped, and the abdomen preternaturally prominent. The extremities were cold, the bowels regular, and the appetite good, the respiration was embarrassed, and performed with a kind of croaking sound. At night he snored very loud, and often waked up struggling for breath, the voice being muffled, and the articulation indistinct. His pulse was natural, his strength was rather impaired, and his muscles were thin and flabby.

"Projecting from the anterior part of the upper jaw was a tumor, of a pale color, inelastic, perfectly insensible, and of firm consistence, presenting very much the appearance of the snout of a hog, as represented in the sketch. It stood off very obliquely, and received but a very partial covering from the corresponding lip. It was rough on the surface, and was about an inch and a quarter in its antero-posterior diameter, its length having been about one inch and a half. At its free margin, which was quite irregular, was seen the tip of the left central incisor. Extending back from this tumor on each side, the whole length of the jaw, was the enlarged gum, forming a thick, broad ridge, completely embedding the teeth. At several points, particularly behind the morbid growth, was more than nine lines in width; in front and at the middle it was less. It was of a more florid color than the main tumor, but of about the same degree of consistence. Opposite the site of the bicuspid teeth, on each side, it exhibited a remarkably granulated appearance, the excrescences having a pedunculated form, and being folded upon each other. Projecting toward the roof of the mouth, it greatly encroached upon this cavity, lessening its capacity, and thus interfering with its functions, as well as with speech and respiration.

"The lower gum was in the same condition as the upper, equally hard and insensible, but less developed. It was of a bluish florid complexion, and larger in front and behind than at the intermediate points; its free surface was uneven and so prominent as to hide all the teeth, except the central incisors, the point of the right cuspid, and the cusps of each deciduous and first permanent molars.

"On looking into the fauces both tonsils were found to be much enlarged, the left, however, more than the right, and the arches of the palate were in a state of chronic inflammation. The uvula was also somewhat hypertrophied. As the respiration was much embarrassed by the state of the tonsils, I excised the redundant portion of the left of these organs as a prelimiuary step to the treatment of the other and more important affection.

"Various plans of treatment had been employed for the relief of the boy before he came under my charge, but all without advantage. Judging from the long continuance of the disease, and the great hardness of the parts, I became soon satisfied that the only remedy that held out any prospect of success was excision. Not knowing what might be the degree of vascularity of the morbid growth, I determined to attack the lower one first, removing as much at one sitting as the circumstances of the case would admit of. The patient being seated upon a chair, with the head supported against the breast of an assistant, I pared away the gum closely from the jaw and teeth, first in front and then behind, using for this purpose the knife, gum-lancet, or chisel, as appeared to be most expedient. About five ounces of blood, principally of a venous character, were lost during the operation. Behind, the excision was not very perfect, owing to the want of suitable instruments, to scrape away the thickened and callous structure. No pain was experienced during the operation, and it is therefore reasonable to suppose that the hypertrophied gum was perfectly insensible. Two of the temporary teeth were removed, the permanent set being found as well developed, or nearly so, as usual in children at this age. They were of a beautiful white color, and firmly rooted in their sockets.

On the fifth of January, three days after the above operation, the boy was taken before the medical class of the University of Louisville, with a view to the removal of the upper gum. Dr. Goddard, he eminent dentist, on this as on the former occasion, gave me his valuable assistance. By means of a chisel, slightly curved, and not very sharp, the greater portion of the morbid mass was easily pared

off in front, exposing the permanent incisors, the two central of which were found to be fully developed, while the lateral incisors were only about one-third grown. In excising the gum from the posterior surface of the jaw bone in front, the anterior palatine artery of the right side was unavoidably laid open, and bled considerably before the flow could be arrested. The larger pieces of the gum being thus removed, Dr. Goddard cut and scraped off the remainder by means of scaling instruments, such as those used by dentists in removing tartar from the teeth, and which were found to be admirably adapted to the object. The proceeding was necessaily tedious on account of the frequent spitting of the patient, and was attended with the loss of at least six ounces of blood. Indeed, the lad became quite pale from this cause. No pain was experienced. One of the deciduous teeth was forced out during the operation. The lad now has in his upper jaw, the two central incisors and first molars fully developed, the lateral incisors about one-third grown, the cusps of the second molars just visible, and the temporary cuspids and second temporary molars.

"In the lower jaw are the four incisors and first permanent molars. The left second molar about one-fourth grown, and the other molar just emerging, with the right temporary cuspid and left temporary molar.

"Finally, a third operation was performed on the 17th of January, mainly by Dr. Goddard, consisted in the removal of remnants of gum between and around the teeth. The instruments employed on the occasion were the same as on the former. By means of these, every vestige of the morbid growth was cut and scraped away. The operation was again tedious and somewhat bloody, but not as much so as before. It was followed by great soreness of the whole mouth, by inability to masticate food, and even by considerable difficulty of deglutition, continuing for nearly a whole week. In consequence of these occurrences free use was obliged to be made of anodynes, especially at night. Since the last two operations the boy has been taking sulphate of iron and quinine, to improve his general health and the condition of the blood, which, as evidenced by the pallor of his countenance, has been much impoverished by the repeated losses sustained in the excision of the gums. He left Louisville on the 4th of March, still rather pale and feeble, but in fine spirits and with a good appetite. A few days before his departure I excised a portion of the right tonsil, the left, as already stated,

having been removed a few days after his arrival in town. His breathing is too loud, though he no longer snores and perspires during sleep. Orders were given to keep up the steady use of his tonics, to make him exercise freely in the open air, and to put him upon a plain but nutritious diet. The tonsils and arches of the palate are to be mopped every fourth day with a pretty strong solution of nitrate of silver. The teeth are covered up to their necks with healthy gum; and thus far, there is not the slightest appearance of a return of the morbid growth.

"On closing the jaws so as to bring the grinders in contact, a space is found to exist between the front teeth, three quarters of an inch in extent. The upper lip is gradually regaining its proper position, and the contour of the face is greatly improved."

EDITORIAL DEPARTMENT.

BIBLIOGRAPHICAL.

The Microscope: its History, Construction and Application. By Jabez Hogg, Esq., M. R. C. S., &c. Ingram & Co., London.

The use of the microscope, until within the last few years, was confined to men of means and of scientific research; the books that have been published upon the subject have either been too expensive or too scientific for our intelligent artisans—not so with the volume before us, comprising as it does, in a popular and cheap form, a cyclopœdia of information on all subjects relating to the microscope. In the days of Sir John Hill the microscope was not only a philosophic toy, but was most imperfect in its construction, and its application was also limited to the discovery of huge monsters in drops of water, things depicted upon a disc as large as a household warming pan. Mr. Hogg not only illustrates vegetable life, but every thing relating to animal fungoid diseases, human skin, &c. with upwards of three hundred wood cuts.

The microscope has revealed to us that many of the skin diseases attacking the human frame are but other forms of the same growth of parasitic fungi, or cryptogamia, another low form of plant, presenting at first fila-

ments simple, then ramified, and formed by a single elongated cell, or several cells placed end to end, as in those of the yeast-plant. The disease known as *ringworm* infesting the heads of children, is one out of forty-eight different species of *cryptogamia.* The conditions of growth of this low form of vegetable life on the human body are the same as in other situations. Dr. Gudden, who has lately published a work upon *cutaneous Diseases caused by "Parasitic Growths,"* describes ringworm under the name of *porrigo-fungus;* the spores of which are round on the upper, and filamentous on the under surface. Whenever the healthy chemical processes of nutrition are impaired, and the incessant changes between the solids and the fluids slacken, then the skin may furnish a proper soil for the fungi to take root in, should the sporules come in contact with it. That dreadful disease known as cancer will no doubt ultimately prove of vegetable growth, or a conversion of the nutritive animal cell into that of a fungoid vegetable cell.

The Rev. S. G. Osborne, during the cholera visitation of 1854, endeavored to direct public attention to the very general distribution of fungi He says: "Only those who have closely studied those fungi can be aware how very minute and yet how systematically formed they are. Preparations of a dozen different species, taken from the grape, potato, parsnip, bean, cucumber, cineraria, veronica, &c., many of which have been in fluid for more than a year, retain their form as perfectly as if only taken from the plant a day. No two are alike in form, but all are alike in this—under the very high powers of the microscope they show an external hyaline case, with a second utricle, or inner case, full of minute spores.

If a few leaves of the infected haulm of the potato are taken, and gently shaken over a piece of black paper, a quantity of very fine white powder is obtained; place a little of this in fluid, under a power of 500 linear; every atom of this powder will resolve itself into a distinct cell, somewhat of the form of an ace of spades, varying more or less in size, from about 3-5000ths of an inch in length. There will be seen a well defined outline of an inner cell, in which are many hundred greenish-looking spores; some of the cells will burst, and by using a still higher power it will be seen that these have all the shapes and characteristics of the parent cell. Several of them lie easily between the lines on a micrometer, which lines are just 1-5000th of an inch apart.

There can scarcely be one spot of earth on which these fungi do not fall in their thousands. Insoluble in nature, they wait where they fall, the growth of the particular plant for which each has its own affinity, that if that plant grows on that spot, its enemy is near, on the very soil from which it is to draw life. But I further believe that there must be some peculiar disposition yet to be developed in the plant before the fungus will act upon it, to its own rapid development, and the destruction of the said plant.

Our limited knowledge of the matter does not forbid the supposition that there may be some, even among the purely vegetable fungi, which might in certain conditions of the human body, when taken into the frame, produce immediate severe constitutional disturbance. The *sarcina* may be cited as an instance of this fact. It strikes us, however, as far more probable, that from drains and cesspools—reservoirs as they are for excrementitious animal matter—may emanate certain specific fungi, the spores of which, under certain conditions of atmosphere, would be given out in such quantities, and in such minute particles, as easily to be carried about by every current of air. Persons in health may inhale and swallow these spores, and escape injury from them. Other persons, depressed physically, from local or accidental causes, may afford to them just the *pabulum* which will develop their poisonous quality.

Many animal organisms, such as infusorial animalcules and their ova, are frequently found floating about in the air, as well as the fungi spoken of.

Animals, birds, insects and fishes alike suffer from the ravages of fungi. One of the most prevalent of these, observed among our domestic pets, is the fungi growing over the upper surface of the gold-fish; death is almost certain when this white fungoid disease once commences its ravages. Great devastation is at times committed amongst silkworms by the *botrytis,* causing a disease called *muscardine,* just as they are about to enter the chrysalis state.

The author deserves the thanks of all lovers of science for the vast amount of industry and scientific research he has shown in the collection of his materials, &c., and the simple and forcible manner in which he treats the various subjects, directing the student in popular phraseology how to investigate and practice the use of the microscope. R.

Dental Anæsthesia.—Painless Tooth Extraction by Congelation. By Richard Quinton.

We have received from the author a copy of this work and have read it with much interest. Our views of this *questio vexata* is well expressed in the preface. "In the enthusiasm engendered by new discoveries, a tendency to exaggeration is often manifested." How far the writer has been successful in his efforts to "steer clear of this, by demonstrating the general and particular physiological effects of the agent in question; and while commending its virtue, avoiding the error of ascribing to it omnipotence," we shall not say.

The treatise contains much matter that will well repay a careful perusal; it also contains information, good enough in its place, but quite irrelevant to the subject in hand. This occasional irrelevance, a certain high flown style at times out of place, with here and there symptoms of mere book-

making craft, are blemishes in an otherwise excellent little work. We should have been better pleased had the author given an illustrated description of his apparatus for the *gradual* application and withdrawal of cold. Rapid freezing, with no measures taken to arrest too sudden reaction, Mr. Quinton unhesitatingly condemns. Is there no advocate of this truly American method of applying Dr. Arnott's discovery prepared to bring forward the results of his experience in its defence? We stand open to conviction.

P. H. A.

MISCELLANEOUS NOTICES.

American Dental Convention.—It will be seen from the proceedings published in another part of the present number of the Journal, that the second meeting of the above named association was held at Hope Chapel, in the city of New York, on Wednesday, Thursday and Friday, the 6th, 7th and 8th of August, 1856, and we hesitate not to say, it was the most numerous assemblage of dentists ever convened either in this or any other country. Twenty states, the District of Columbia and the Island of Cuba were represented on the occasion, and there were present, as nearly as we could judge, at the morning session of the second day, about two hundred and twenty-five, though the Secretary only succeeded in obtaining the names of one hundred and eighty-six, but many of the members had left the city before he commenced taking them—this having been deferred until towards the close of the Convention.

The deliberations of this large assemblage were characterized by the utmost harmony and good feeling—the object of the members generally of the Convention appearing to have been a desire to enlarge their professional knowledge, that they might return to their respective fields of labor with increased ability for usefulness.

Among the subjects which came up for discussion before the Convention, as will be seen from the proceedings, and which occupied the greater portion of the time of its meetings, were, the pathological conditions of dentine, and the best preparation of gold for filling teeth. These discussions were highly interesting, and will, we have no doubt, be read with interest by the members of our profession. Professor Watt, of Cincinnati, Ohio, read, by request of the Convention, an interesting paper, which we hope to be able to lay before our readers in a future number, on the action of certain remedial agents on inflamed dentine. A paper was also read by Professor Townsend, of Philadelphia, on Professional Fees, which elicited the approbation of the members generally, and was ordered to be printed in pamphlet form.

During the afternoon session of the last day of the Convention, a number of improvements and inventions were presented, which, in a future

number of the Journal, we may take occasion to notice at some length. We would do so now, if time permitted.

That the annual deliberations of this Convention will be productive of great good, does not, we think, admit of doubt, and most sincerely do we trust that the future meetings may be as largely attended as the last. The next is to be held in Boston, the second Tuesday in August, 1857.

On the evening of the second day, Messrs. Jones, White & McCurdy, gave a splendid entertainment at the Astor House, to the members of the Convention, and on the evening of the third day, they were again feasted with good things by the dentists of New York, Brooklyn and Williamsburg.

Western Dental Society.—We publish in another part of the present number of the Journal, the proceedings of a meeting of the Western Dental Society, held at Chicago, Ill., July 30, 1856, reported by Dr. Solyman Brown, for the Dental Forcep. The proceedings of this Association will also be found interesting as showing the efforts which the dentists of the West are making for the elevation and advancement of the profession. We had an invitation to attend and would most gladly have availed ourselves of it had circumstances permitted. We wish our brethren of the West great success in their praiseworthy enterprise, and most earnestly do we hope we may have the pleasure of being with them at some future meeting.

Dental Obturator.—This is the name of a spirited and ably conducted Quarterly, of some thirty-two pages, under the editorialship of John S. Clark, D. D. S., of New Orleans, and devoted to the science and art of dentistry. We had the pleasure of making the acquaintance of the editor at the Dental Convention in August last, and have since received from him the first volume of his valuable and interesting publication, neatly bound, for which, we beg to return him our sincerest thanks. We had previously, a short time before the publication of our July number, received a number of this neat little Quarterly, and intended to have called the attention of our readers to it, but it escaped our attention until it was too late to do so. We hope to receive it hereafter regularly, and take pleasure in placing it upon the list of our exchanges.

British Journal of Dental Science.—Some twelve or fifteen years ago we had the pleasure of congratulating our professional brethren of Great Britain on the advent, first of a quarterly, and soon after of a semi-monthly journal, devoted to the advancement of dental science. The first of these publications terminated, we believe, with the issue of one number; the second, a very ably conducted paper, was continued, we regret to say, but lit-

tle more than a year, when it also ceased to exist. The members of the dental profession are now vastly more numerous than they were at the time these publications were started, and will, we doubt not, extend to the present enterprize, sufficient support, both in contributions to its pages and subscriptions, to ensure its permanent continuance. It is published monthly, and we have received the July and August numbers, which contain several interesting and well written articles, some of which we would copy in the present number of our journal, had we received them in time. The editorial of the second number sets forth very ably, the importance of the immediate organization of a college or institute of dental surgery in England, and we hope the wishes of the editor may soon be realized. We would be glad, if space permitted, to transfer his remarks upon this subject to the pages of our own journal, but at present we cannot do so.

The conductors of the British Journal of Dental Science have our best wishes for the success of their enterprize.

Dental Register of the West.—The July number of this valuable and ably conducted quarterly, contains the valedictory of our old friend, Professor Taylor, who was the original projector, and has been the principal, and a large portion of the time, the sole editor of the publication. Few men would persevere as he did, under the discouragements with which we know he had to contend, before sufficient support was given to the noble enterprize, in which he had engaged to indemnify him against actual loss. But these difficulties did not dampen the ardor of his efforts for a single moment, or cause him to falter in the undertaking; on the contrary, they only served to strengthen his energies, and thus he struggled on, increasing the value of the Register every year, until it was established upon a firm basis. It is impossible for any one not engaged in an enterprize of this kind to form an adequate idea of the difficulties and vexations with which the conductors of such publications, have, for a while, at least, to contend.

We regret most sincerely the loss, from the corps editorial, of so valuable a co-laborer. In retiring from the editorial duties of the Register, Professor Taylor takes with him our best wishes, and we almost envy him the enjoyment he must experience in being relieved from the toil and perplexity necessarily incident to the conducting of a professional periodical. We trust, however, he will not lay aside his pen altogether.

But while the retirement of Professor Taylor, from the editorship of the Register will be regretted by the readers of that publication generally, it cannot be othewise than gratifying, that it is confided to gentlemen in every respect so well qualified to conduct it, as Professors Watt and Taft, under whose editorial management, it will hereafter be carried on. In assuming the duties of the editorial chair, we most cordially extend to them the right hand of fellowship, and welcome them to their new field of labor.

The New York Journal of Medicine.—This excellent monthly comes to us in a new and improved form. It has incorporated with it the New York Medical Times, and has added to its former editorial corps, Dr. H. D. Bulkley, formerly editor of the Medical Times. In addition to the usual variety of papers on medical subjects, every number hereafter is to contain abstracts of the proceedings of the medical societies, as well as of those read before them, and clinical reports of the hospitals of the city Among other valuable papers, the present number contains one on the connection of bronzed skin, with disease of the super-renal capsules, illustrated with three colored engravings.

Aluminium.—This metal has been suggested to dentists as a substitute for gold in plate-work. It possesses many properties which would render it very desirable to employ it. In the first place its specific gravity (2.25) is much below that of the ordinary metals. It is nearly that of glass, and this lightness must of course add greatly to the comfort with which plates made of the new metal could be worn. Again, it has no tendency to rust and is not acted on by any of the ordinary solvents. Sulphur does not affect it, nor will any of the oxy-acids dissolve it, its only solvent being hydrochloric acid. This indifference to chemical agents has been supposed to be due to the formation of an oxyd, a thin film of transparent sapphire, at the instant it comes in contact with the atmosphere. Its fusing point is lower than that of silver, and higher than the melting point of zinc. It is malleable, ductile and sonorous.

Its present price in England, is £3, or fifteen dollars per ounce. This is about 25 per cent. cheaper than gold. In reality, however, the ratio between its price and that of the precious metal now used for plate-work, is much less than this statement would imply. Being so very far below gold, in specific gravity, a given weight of aluminium would go more than eight times as far as the same quantity of gold.

With most of the metals it forms characteristic alloys. With copper it forms a fine gold-colored alloy which does not appear to tarnish readily. Mixed with gold, a very small proportion of it changes the yellow color of that metal to gray.

For the benefit of those who may wish to experiment with this new metal, we give the formula for a *solder of aluminium.* It is composed of *two* parts of aluminium and *one* of silver—without flux.

Saliva.—M. Longet has been examining the relations of *sulpho-cyanide of potassium.* He confirms the opinion of Wright, Lehmann and other chemists that this salt is a constant ingredient of saliva, and attributes the variations in its quantity solely to the degree of concentration of the salivary fluid. It exists not only in the mixed saliva but in that of each individual gland.

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